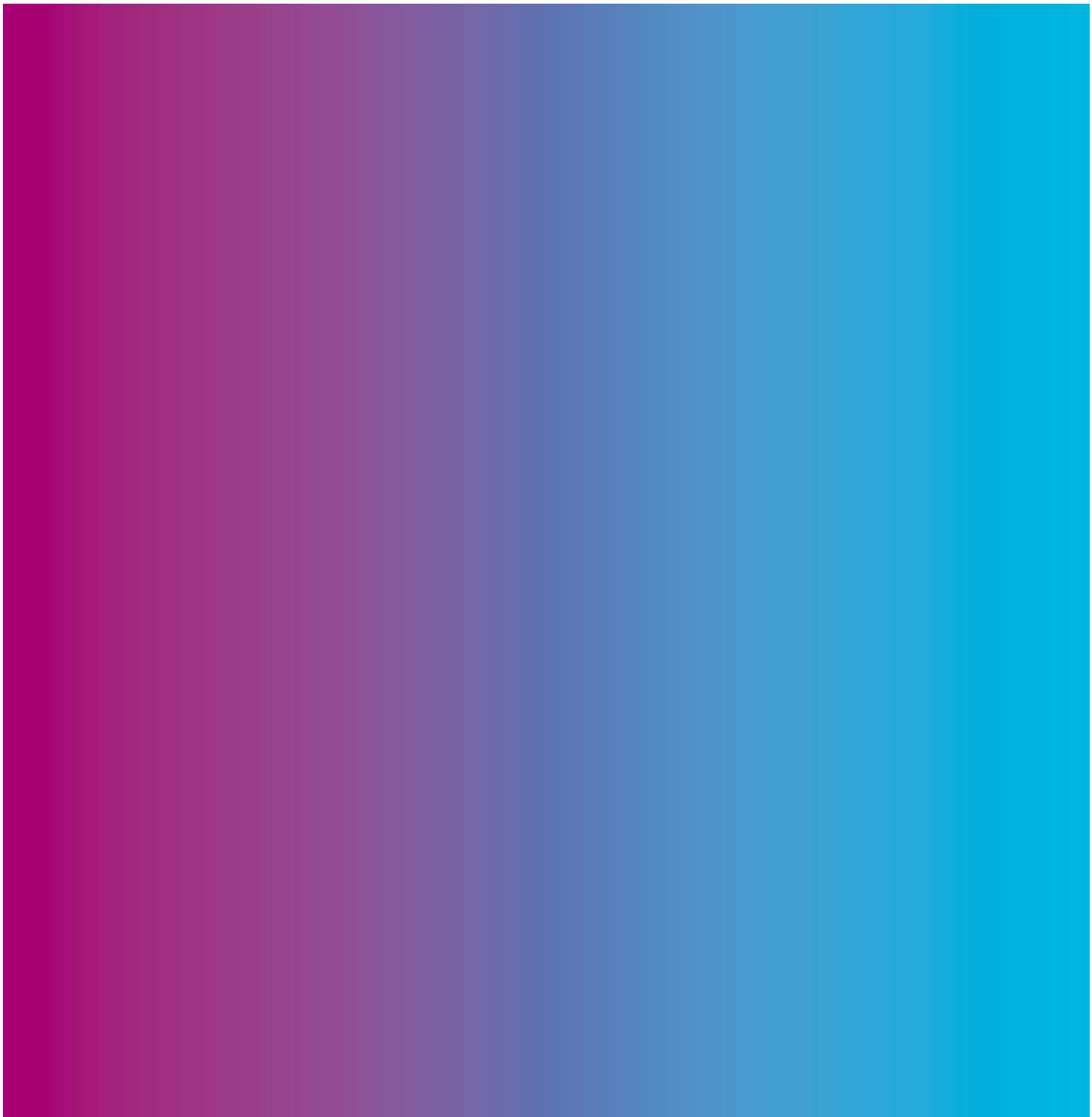
Marstel Terminals Pty Ltd
4 November 2011

Bulk Fuel Storage Facility

Environmental Assessment



Bulk Fuel Storage Facility

Environmental Assessment

Prepared for

Marstel Terminals Pty Ltd

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Quality Information

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Reviewed by Troy Collie

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C	4-Nov-2011	Final	Renae Gifford Principal Environmental Scientist	

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Certification

Submission of Environmental Assessment (EA) prepared under the *Environmental Planning and Assessment Act 1979* Section 75F

EA prepared by		
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in respect of	Bulk Liquids and Fuel Storage Facility, Port of Newcastle	
Project application	AECOM Australia Pty Ltd (AECOM)	
Applicant name		
Applicant address	PO Box 73 HRMC NSW 2310	
Land to be developed		
Lot no., DP/MPS, vol/fol etc	Part of 33 D.P. 1116571	
Proposed project	Proposed construction and operation of a bulk liquid storage facility.	
	Map(s) attached	
Environmental Assessment	an Environmental Assessment (EA) is attached	
Certification	I certify that I have prepared the contents of this Environmental Assessment and to the best of my knowledge it is true in all material particulars and does not, by its presentation or omission of information, materially mislead.	
	Signature	Signature
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	Date 4/11/11	Date 4/11/11

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Table of Contents

Executive Summary i
1.0 Introduction 1
1.1 Purpose 1
1.2 Background 1
1.3 Project Summary 2
1.4 Location 2
1.5 The Applicant 5
1.6 The Environmental Assessment Process 5
1.6.1 Major Projects 5
1.6.2 Environmental Assessment Requirements 5
1.6.3 EA Exhibition 6
2.0 The Site and Context 7
2.1 Site Description 7
2.2 Site History 7
2.3 Surrounding Land Use 8
2.4 Land Ownership and Legal Description 8
3.0 Project Description 11
3.1 Project Need 11
3.1.1 Purpose 11
3.1.2 Australian Fuel Demand Trends 11
3.1.3 Demand for BioFuels 11
3.1.4 Demand for Bulk Fuel Storage in Hunter Region 12
3.2 Alternatives 12
3.2.1 Site Location 12
3.2.2 Site Layout 13
3.3 Access and Services 14
3.4 Project Activities 17
3.4.1 Fuel Delivery by Ship 17
3.4.2 Fuel Delivery by Road 18
3.4.3 Bulk Fuel Storage 18
3.4.4 Fuel Dispatch via Road 21
3.5 Proposed Development 21
3.5.1 Fuel Pipeline 21
3.5.2 Tank Farm 21
3.5.3 Transport Movements 22
3.5.4 Hours of Operation 22
3.5.5 Interfaces 22
3.6 Proposed Construction Activities 25
3.6.1 Program of Works 25
3.6.2 Outline of Construction Activities 25
3.6.3 Proposed Modifications to the Existing Remediation 28
3.6.4 Site Management Plan 29
3.6.5 Construction Environmental Management Plan 29
3.6.6 Maritime Safety and Traffic 29
3.6.7 Ship Transfer Operation 30
3.6.8 Transfer Pipeline 30
3.6.9 Storage Tanks 31
3.6.10 Road Tanker Loading / Unloading 31
3.6.11 Stormwater Management 31
3.6.12 Fire Management 32
3.6.13 Security 32
3.6.14 Contaminated Site Management Plan: Intertrade Industrial Park 33
3.7 Consistency with Concept Plan 33
4.0 Statutory Planning 35
4.1 Local Matters 35
4.1.1 Newcastle Local Environmental Plan 35

4.1.2 Newcastle Development Control Plan 2005 35
4.2 Regional Matters 36
4.2.1 Lower Hunter Regional Strategy 36
4.3 State Matters 36
4.3.1 Environmental Planning and Assessment Act 1979 (EP&A Act) 36
4.3.2 State Environmental Planning Policies 36
4.3.3 Protection of the Environment Operations Act 1997 39
4.3.4 National Parks and Wildlife Act 1974 39
4.3.5 Heritage Act 1977 40
4.3.6 Roads Act 1993 40
4.3.7 Water Management Act 2000 40
4.3.8 Water Act 1912 41
4.4 Commonwealth Matters 41
4.4.1 Environment Protection and Biodiversity Conservation Act 1999 41
4.5 Approvals Required 41
4.5.1 Environmental Protection Licence 41
5.0 Consultation and Identification of Issues 43
5.1 Formal Procedure for Consultation 43
5.2 Consultation with Stakeholders and other Relevant Authorities 44
5.3 Community Consultation 47
6.0 Prioritisation of Issues 49
6.1 Issue Identification 49
6.1.1 The Issues 49
6.2 Issue Prioritisation 49
6.2.1 Approach 49
6.3 Assessment 50
6.4 Final Assessment 50
7.0 Preliminary Hazard Analysis 51
7.1 Methodology 51
7.2 Predicted Impacts 51
7.3 Recommendations 55
8.0 Surface Water Quality 57
8.1 Existing Conditions 57
8.2 Predicted Impacts 57
8.3 Environmental Safeguards 58
8.4 Residual Impacts 60
8.5 Conclusion 60
9.0 Air Quality, Odour and Greenhouse Gas 61
9.1 Existing Conditions 61
9.2 Methodology 61
9.3 Predicted Impacts 62
9.4 Climate Change and Greenhouse Gas Assessment 63
9.4.1 Electricity Consumption 63
9.4.2 Fuel Consumption 63
9.4.3 GHG Emission Summary 65
9.5 Conclusions 65
10.0 Groundwater 69
10.1 Existing Conditions 69
10.2 Predicted Impacts 69
10.3 Environmental Safeguards 70
10.4 Residual Impacts 72
10.5 Conclusions 72
11.0 Soils and Acid Sulfate Soils 73
11.1 Existing Conditions 73
11.2 Predicted Impacts 74
11.3 Environmental Safeguards 74
11.4 Residual Impacts 74
11.5 Conclusions 75

12.0 Noise and Vibration 77
12.1 Existing Conditions 77
12.2 Project Specific Noise Criteria 78
12.2.1 Construction Noise 78
12.2.2 Operational Noise 79
12.2.3 Construction and Operational Vibration 79
12.3 Predicted Impacts 80
12.3.1 Construction Noise Impacts 80
12.3.2 Operational Noise Impacts 81
12.3.3 Sleep Disturbance Criteria 82
12.3.4 Road Traffic Noise 83
12.4 Conclusion 83
12.4.1 Construction noise and vibration 83
12.4.2 Operational noise and vibration 84
12.4.3 Sleep disturbance 84
12.4.4 Cumulative noise impacts 84
12.4.5 Road traffic noise 84
13.0 Traffic and Transport 87
13.1 Existing Conditions 87
13.2 Predicted Impacts 87
13.2.1 Construction Traffic Impacts 87
13.2.2 Operational Traffic Impacts 88
13.3 Environmental Safeguards 92
13.4 Residual Impacts 92
13.5 Conclusions 92
14.0 Visual 95
14.1 Existing Conditions 95
14.2 Predicted Impacts 95
14.2.1 Industrial Drive 95
14.2.2 Cormorant Road, Kooragang Island 95
14.2.3 Mayfield Residential 95
14.2.4 Hunter River 96
14.2.5 Surrounding Industrial 96
14.3 Environmental Safeguards 96
14.4 Residential Impacts 96
14.5 Conclusions 96
15.0 Waste Management 97
15.1 Predicted Impacts 97
15.1.1 Construction 97
15.1.2 Operation 97
15.2 Environmental Safeguards 98
15.2.1 Waste Strategies 98
15.2.2 Avoidance 98
15.2.3 Reuse 98
15.2.4 Recycling 98
15.2.5 Disposal 98
15.3 Residual Impacts 98
15.4 Conclusion 98
16.0 Ecology 99
16.1 Existing Conditions 99
16.2 Flora and Fauna 99
16.3 Matters of National Environmental Significance 99
16.4 Predicted Impacts 100
16.5 Mitigation Measures 100
16.6 Conclusion 100
17.0 Indigenous Heritage 103
17.1 Existing Conditions 103
17.2 Mitigation Measures 103

17.3 Conclusion 103
18.0 Non-Indigenous Heritage 105
18.1 Existing Conditions 105
18.2 Conclusion 108
19.0 Other Environmental Considerations 111
20.0 Residual Risk Analysis 113
20.1 Analysis 114
20.2 Conclusion 114
21.0 Statement of Commitments 115
21.1 Introduction 115
21.2 Summary of Safeguards 115
21.3 Environmental Management and Monitoring 116
21.4 Commitments 117
22.0 Consistency with Concept Plan 121
23.0 Cumulative Impacts 127
23.1 Introduction 127
23.2 Cumulative Impact Assessment 127
24.0 Proposed Justification 129
24.1 Justification 129
24.2 Biophysical Factors 129
24.3 Sociocultural Factors 130
24.4 Economic 130
24.5 Ecologically Sustainable Development 130
24.5.1 Precautionary Principle 130
24.5.2 Intergenerational Equity 131
24.5.3 Biological Diversity and Ecological Integrity 131
24.5.4 Valuation and Pricing of Environmental Resources 131
24.6 The Objects of the *Environmental Planning and Assessment Act 1979* 131
24.7 Climate Change and the Greenhouse Effect 133
24.8 Project Sustainability 133
24.9 Consequences of Not Proceeding 133
25.0 Conclusion 135
26.0 References 137

Appendix A
The Director-General's Requirements A

Appendix B
Visual Impact Assessment B

Appendix C
Proposed Construction Timeline C

Appendix D
Transport Assessment D

Appendix E
Preliminary Hazard Assessment E

Appendix F
Air Quality Impact Assessment F

Appendix G
Noise and Vibration Impact Assessment G

Appendix H
Heritage Database Searches H

Appendix I
Ecology Desktop Searches I

List of Figures

Figure 1	Regional Context	3
Figure 2	Site Location	4
Figure 3	Proposed Subdivision of Lot 33 DP 1116571	9
Figure 4	Proposed Construction Access	15
Figure 5	Proposed Operational Access	16
Figure 6	Proposed Site Layout	20
Figure 7	Typical Bund Wall	67
Figure 8	Noise Monitoring Locations	85
Figure 9	Traffic Movements	93
Figure 10	Landscaping	101
Figure 11	Non-Indigenous Heritage	109

List of Tables

Table 1	Land Ownership Details	8
Table 2	Tank farm structures	21
Table 3	Proposed timeline for construction activities	26
Table 4	Environmental Assessment Requirements (DGRs)	43
Table 5	Stakeholder Consultation	45
Table 6	Community group consultation – questions and responses	47
Table 7	Issues Identified by DP&I and Community Groups	49
Table 8	Issues Prioritisation Matrix	50
Table 9	Prioritisation of Environmental Issues	50
Table 10	Operational Hazards	51
Table 11	Stormwater Containment Components	59
Table 12	Predicted Maximum Receptor Benzene GLC ($\mu g/m^3$), modelled outputs for conservative scenario	62
Table 13	GHG Emissions from Electricity Use	63
Table 14	Emissions – Delivery and Dispatch by Truck	64
Table 15	Scope 1 Emissions – Delivery of Diesel by Ship	64
Table 16	Scope 1 Emissions – Passenger Vehicles for Commuting Staff	64
Table 17	Scope 3 Emissions - Consumption of Fuel Distributed by Proposed Facility	65
Table 18	Direct and Indirect GHG Emissions Summary	65
Table 19	CSMP Barrier Wall Requirements	70
Table 20	Measured Noise Levels	77
Table 21	Construction noise management levels – Residential receivers	79
Table 22	Final project specific environmental noise criteria	79
Table 23	Predicted construction noise levels – Residential receivers (refer to Plate 1 for situation)	80
Table 24	Noise contribution at representative receiver locations during night-time operational conditions – Amenity criteria	81
Table 25	Noise contribution at representative receiver locations during night-time operational conditions – Intrusiveness criteria	82
Table 26	Noise contribution at representative sensitive receiver locations during night time operational conditions	82
Table 27	Summary of traffic flow increase	83
Table 28	Potential Traffic Generation	88
Table 29	AM Peak intersection Performance Industrial Drive / George Street	89
Table 30	PM Peak intersection Performance Industrial Drive / George Street	89
Table 31	AM Peak intersection Performance Industrial Drive / Ingall Street	90
Table 32	PM Peak intersection Performance Industrial Drive / Ingall Street	90
Table 33	AM Peak Intersection Performance Industrial Drive / Ingall Street – with internal link road	90
Table 34	PM Peak Intersection Performance Industrial Drive / Ingall Street– with internal link road	91
Table 35	Parking and Access Assessment	91
Table 36	Construction Waste	97
Table 37	Operation Waste Streams	97
Table 38	Non-indigenous Heritage	105
Table 39	Other Environmental Issues	111

Table 40	Significance of Effects	113
Table 41	Manageability of Effects	113
Table 42	Residual Risk Matrix	114
Table 43	Risk Profile – Proposed Upgrade	114
Table 44	Summary of Safeguards	115
Table 45	Management Plans	116
Table 46	Monitoring	117
Table 47	Statement of Commitments	118
Table 48	Consistency with Concept Plan EASRs	121

Executive Summary

Introduction

This Environmental Assessment (EA) has been prepared by AECOM Australia Pty Ltd (AECOM) on behalf of Marstel Terminals Pty Ltd (Marstel) for the proposed construction and operation of a bulk liquid storage facility on industrial land managed by the Newcastle Port Corporation (NPC) at the Mayfield Concept Approval Site, Newcastle, New South Wales. The proposed facility would be used to receive, store and distribute high quality diesel and biodiesel for customers throughout the Hunter Region.

Project Approval is being sought for the proposed bulk liquids storage facility. The Minister for Planning would be the approval authority for this application. AECOM has prepared this EA in accordance with the provisions of the former Part 3A of the *Environmental Planning and Assessment Act 1979* and the *Environmental Planning and Assessment Regulation 2000*, together with the Director-General's Environmental Assessment Requirements which were issued to the proponent on 7 July 2011. As the Project was declared to be a project to which Part 3A of the EP&A Act applied before 1 October 2011, the Project can continue to be assessed under the transitional arrangements for Part 3A projects.

Fuel consumption is increasing throughout Australia and there is a strong shift to utilise biofuels as a renewable resource. Existing and proposed urban and industrial activity throughout the Hunter Region has increased the demand for fuels, thus improved accessibility to biofuels is significant to the sustainable growth of the region.

Refining capabilities in Australia are operating at maximum production. Therefore, the increasing demand for fuel would need to be met through imports, which are received via ship freight. This would in turn require waterfront terminal facilities. The existing fuel terminal facilities in Newcastle receive fuel via truck or pipeline from Sydney.

The provision of terminal facilities at a shipping point for the storage and distribution of fuels, including biofuels, within the Hunter Region would assist in achieving sustainable economic growth in the region as well as assisting in delivering the State Government policy for biofuels consumption.

Site and Context

The Facility is to be located on part of the former BHP Steelworks Site, approximately 5 km north-west of Newcastle CBD. The land on which the Facility is to be located would be leased from Newcastle Port Corporation, and is currently subject to concept approval submission 09_0096 by the Newcastle Port Corporation (Mayfield Concept Approval Submission).

In July 2002, ownership of the part of former Steelworks Site, known as the 'Closure Area Site', was transferred to the State Government. In March 2003, the Hunter Development Corporation (formerly the Regional Land Management Corporation Pty Ltd (RLMC)) was created by the Government to manage the day-to-day activities of the former BHP site and other Crown land in the Lower Hunter Region, including remedial and redevelopment works for the Closure Area Site (SKM 2004).

The nearest residential area is located at Mayfield, with the closest receptors approximately 900m from the proposed Site. Neighbouring industries include OneSteel and Koppers Coal Tar Products.

Project Description

The proposal is for the establishment of a bulk fuels terminal which would comprise:

- Use of an existing ship berthing facility (Mayfield 4) to deliver fuels from bulk tankers to the terminal.
- Storage of bulk fuels in above ground tanks
- Distribution of fuels by road tankers.

Diesel fuel would be delivered to the Facility from the ship at berth via a dedicated pipeline. The pipeline would follow the route of the existing pipeline that is operated by Koppers. It is proposed that the pipeline would use the current pipeline supports that exist for Kopper's operations. This would be a schedule 40 carbon steel pipe with a 300 mm diameter and all joints fully welded and tested in accordance with AS2885 – 2008 Pipelines Gas & Liquid Petroleum – General Requirements.. The wharf line would be 'pigged' clear once the import of diesel is

completed. This would ensure that there is no product wastage, and that there is no residue remaining in the pipeline.

The proposed tank farm layout is considered optimum for the Site and use. The tank sizes are suitable for the fuel loads delivered by truck and ship. The tank storage and bunded area is located adjacent to the existing groundwater barrier wall. This would minimise any potential interception of the bund wall during construction.

Proposed site structures include:

- 3 x diesel storage tanks (38 m diameter and 18 m high)
- 1 x biodiesel storage tank (8 m diameter and 12 m high)
- 1 x additive tank (3 m diameter x 6 m long)
- 1 x slops tank (2.6 m diameter x 4.5 m long)
- Office and amenities (16 m x 9 m and 4 m high)
- Truck loading gantry (33.5 m x 16.5 m and 6.5 m high)
- Fire water storage tank (10.5 m diameter and 8.5 m high)
- Firepump building (15.5 m x 5 m and 5.5 m high)
- Workshop and MCC (10 m x 9 m and 5 m high).

The fuel storage tanks would be constructed on foundations fitted with tell-tale drains to detect under-floor leaks. The tank storage area would be surrounded by concrete bund walls approximately 2.5 m high, with intermediate bunds 0.6 m high designed in accordance with *AS 1940-2004 The storage and handling of flammable and combustible liquids*.

This proposal is seeking the approval of an initial operation phase at the Facility. During this initial operation phase, daily road traffic movements would consist of biodiesel tanker deliveries, the dispatch of diesel and biodiesel by fuel tanker, and the movements of employees and visitors. It is anticipated that Marstel would, in the future, seek approval to expand the operation of the facility when throughputs increased. Estimated truck movements at start up would be 18 trucks delivering to or dispatching from the Site per day. Ship movements would be in the order of 8 Medium Range vessels per year for imports of diesel

The Facility would be open for product dispatch via road and fuel delivery by ship 24 hours per day as required. Marstel is therefore seeking approval for 24 hour operations provided that noise levels from the Facility meet amenity criteria at sensitive receptor locations. Shipping operations would be undertaken as required, which could be at any time or day of the week, with unloading typically undertaken over a 36 hour period.

Statutory Planning

The Site is located within the Newcastle City LGA where the relevant local Environmental Planning Instrument (EPI) is the Newcastle Local Environmental Plan (LEP 2003). However, clause 16 of LEP 2003 identifies the proposed Site as lying within the boundary of Three Ports Site (*State Environmental Planning Policy (Major Projects) Amendment (Three Ports) 2005*), and thus falling under the provisions of the *State Environmental Planning Policy (Major Development) 2005* (Major Development SEPP). By virtue of Part 20(4) of Schedule 3 Major Development SEPP, the provisions of the LEP 2003 and all other EPI's do not apply to the proposed Site.

The Project is nevertheless consistent with the provisions of local, regional and State planning instruments which would otherwise apply to the proposal, including:

- *Newcastle Local Environmental Plan 2003*.
- *Newcastle Development Control Plan 2005*.
- *Lower Hunter Regional Strategy*.
- *State Environmental Planning Policy (Major Development) 2005*.
- *State Environmental Planning Policy (Infrastructure) 2007*.
- *State Environmental Planning Policy 33 – Hazardous and Offensive Development*.
- *State Environmental Planning Policy 55 – Remediation of Land*.

- *State Environmental Planning Policy 71 – Coastal Protection*.

Consultation and Identification of Issues

As part of the environmental assessment process, consultation was undertaken with the following authorities:

- Department of Planning and Infrastructure
- NSW Office of Environment and Heritage
- NSW Office of Water
- NSW Maritime
- NSW Department of Primary Industries
- Hunter Development Corporation
- Newcastle Port Corporation
- Newcastle City Council
- Roads and Traffic Authority.

Marstel also undertook consultation with neighbouring industry Koppers during the preparation of the EA to identify potential issues or concerns that they may have had.

Marstel initiated contact with the community during the planning and EA phase of this project. Various community groups were be briefed about the proposed development including construction and operation of the proposal, potential issues that have been addressed in the EA and proposed operational procedures to manage these issues. Further detailed discussion on the consultation undertaken as part of this EA is contained within Section 5.0.

Prioritisation of Issues

Consultation with DP&I together with an Environmental Assessment Scoping Report (EASR), in relation to the previous version of the Project Application, has assisted in identifying issues which continue to be relevant to the Project in its current form.

Where a higher potential effect was identified, the attribute or issue was allocated a higher priority for assessment. The analysis assesses risk on the basis of the potential severity of environmental effects and the likely consequences of those potential effects if unmanaged.

The assessment identified that the prioritisation of environmental issues and therefore the focus of environmental assessment for the Proposed Project should be as follows:

- High: none.
- Medium: hazard and risk; surface water quality; air quality and odour.
- Low: groundwater quality; soils and stability; noise and vibration; consultation; transport and access; visual impacts; greenhouse gas emissions; waste; demand upon community; natural or transport resources; ecology; heritage; socio/economic; utilities; acid sulfate soils.

Hazard and Risk

A Preliminary Hazard Analysis (PHA) was undertaken to assess the potential risk of the proposal. This was undertaken using a qualitative approach as recommended in *Applying SEPP 33 Hazardous and Offensive Industry Development Application Guidelines* (DP&I 1994).

It was identified that only diesel and biodiesel would be stored and handled onsite, and that these are low risk materials due to their high flash points. It was therefore concluded that diesel storage and handling results in a very low risk of ignition, fire or explosion, and that the overall risks at the proposed Facility would be low and within the as low as reasonably possible range.

Surface Water Quality

Surface water management would be undertaken during both construction and operation of the facility. A Construction Environmental Management Plan (CEMP) would be developed to incorporate appropriate erosion and sediment control measures onsite. The operation of the Facility would occur in accordance with the Stormwater Management Plan (SWMP).

The stormwater system has been designed to provide the effective containment of stormwater from the Site, to prevent leaks and spills which may occur from discharging to the Hunter River Estuary and to facilitate the discharge of only clean stormwater to the Hunter River under an EPL. Some captured stormwater may be used to irrigate the small amount of landscaped areas on the Site.

The implementation of the CEMP and SWMP would manage water quality both onsite and runoff to the Hunter River would be implemented. As such, residual impacts to surface water associated with the proposal are considered to be minimal.

Air Quality and Odour

An air quality impact assessment was prepared by AECOM for the Facility. The assessment considered impacts associated with construction and operations including potential odour emissions. Pollutants of potential concern were ethyl benzene, toluene and xylene (BTEX)

Modelling was undertaken using benzene as an indicator of emission impacts as it has strict Office of Environment and Heritage (OEH) requirements, allowing a conservative estimate of VOCs to be predicted. This assessment was undertaken using the TANKS emission estimation model to predict the total VOC emissions from the storage tanks and road tankers. The OEH document *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (OEH 2005) was used to predict the Ground Level Concentrations.

It was predicted that the isolated and cumulative Ground Level Concentrations of the representative VOC benzene would meet the assessment criteria at all modelled sensitive receiver locations.

Operation of the Facility will not to generate a significant quantity of greenhouse gases (GHGs). Operations likely to generate GHGs at the Facility include:

- Electricity to run plant operations such as administration buildings, fuel transportation pumps and plant lighting.
- Small vehicles travelling to and from the Site for plant workers.
- Delivery and distribution of fuels via road to and from the Facility.
- Combustion of fuel distribution from the Facility

The calculation methods for determining GHG emissions were sourced from the Australian Greenhouse Office publication *AGO Factors and Methods Workbook* (Department of Sustainability, Environment, Water, Population and Communities – DSEWPC, 2008). The workbook determines the scope that emissions are reported by the following activity descriptions:

- **Direct (or point source) emission factors** – Emissions produced from sources within the boundary of an organisation and as a result of that organisation's activities. Reported under Scope One.
- **Indirect emission factors** – Emissions generated in the wider economy as a consequence of an organisation's activities but which are physically produced by the activities of another organisation. Reported under Scope Two (indirect) and Scope Three (various).

The results of the modelling predicted that cumulative benzene concentrations would reach less than 40% of the OEH guideline criterion at any sensitive receptor location. As such, no significant air pollutant impacts on the surrounding environment would be expected from the proposed development

The burning of Marstel's product fuel would be over 98% of the total GHG emissions associated with the proposed facility, amounting to an estimated 0.118 Mt CO_2-e per year. The total GHG emissions (0.12 Mt CO_2-e per year) from product moved through the facility were found to represent a small proportion (0.3%) of emissions from the Australian transport sector (44.8 Mt CO_2-e per year) and Australian emissions as a whole (0.02% of 564.5 Mt CO_2-e). Additionally, the proposed project may serve to decrease net GHG emissions from road transport as the proposed facility will be located closer to its markets than current fuel providers,

thereby reducing the truck transportation distance required to supply fuel to service stations. The use of biofuel will also lead to the displacement of fossil fuel use which will lead to a net reduction in GHG from its users.

Groundwater

The uppermost aquifer on the Site is semi-confined with the top of the water table being one to two metres below the existing surface and mostly within the fill materials.

Excavation during the construction of the facility is not anticipated to create interaction with groundwater on the Site. However, four groundwater monitoring wells would be established on the site to provide groundwater monitoring data.

Studies on the former BHP Steelworks Site have indicated concentrations of Polycyclic Aromatic Hydrocarbons (PAHs). Metals, petroleum hydrocarbons and organic compounds (VOCs) may also have been present in the soil profile according to a 2004 SKM report.

A Contaminated Site Management Plan (CSMP) was development and approved for the former BHP site. As part of the CSMP a capping layer and subterranean barrier wall where installed. This proposal is designed not to interfere with the integrity or functionally of that installed and approved system.

During both construction and operation, plant and machinery would be routinely inspected and any oil or fuel leaks would be identified and managed immediately. The Site would be surrounded by an approximately 2.5m concrete bund wall. The bunds are to be overlain with a claymax liner and then sealed with a bitumen prime and seal. The claymax liner would create an impervious seal across the bunds and would be sealed with “bentonite” powder where it connects to the bund wall. In the event that there is spillage of any product in the bunds, it would be contained on the surface of the bund and managed appropriately.

It is considered that the existing groundwater at the Site does not pose a risk to the Proposed Project. Additionally, the construction and ongoing management of the Project would not adversely impact on the quality of the existing groundwater with the implementation of the identified control measures provided in this EA and subsequent operational plans.

Soils and Acid Sulfate Soils (ASS)

The construction and ongoing management of the proposed development would not adversely impact the soil profiles on the Site provided that the identified control measures are implemented.

The soils on the Site comprise fill material underlain by marine and estuarine sediments and Tomago coal measures. According to a report produced by SKM in 2004, reclamation fill on the Site included copper slag and ashes, iron and steel-making slags and process wastes, boiler ash, general waste and building debris from industrial facilities and sand dredged from the South Arm of the Hunter River.

The Site has been subject to numerous site investigations to determine soil contamination during the decommissioning and remediation phases of the Site. These identified areas of contamination related to the previous activities undertaken at the BHP Steelworks. Contaminants of concern in the soil profile below the capping later were primarily Polycyclic Aromatic Hydrocarbons (PAHs). Metals, petroleum hydrocarbons and VOCs may also be present (SKM 2004). Any residual contaminants will not be impacted by the Marstel operation nor would the operation be impinged by the presence of any contaminants.

A review of the *NSW Acid Sulfate Soil Risk Maps* for the Newcastle area was also undertaken. This review identified that:

- There is a high risk of occurrence of ASS in soils at a depth of up to 1 m below natural surface in the area to the south and south-west of the Mayfield Concept Approval Site.
- There is a low risk of occurrence of ASS in soils at a depth of greater than 4 m below natural surface in the area south-west of the Mayfield Concept Approval Site.
- There are no ASS identified at the Mayfield Concept Approval Site.

Thus, no further hazard assessment or mitigation measures for ASS are required for this Site.

Noise and Vibration

A Noise and Vibration Impacts Assessment was prepared by AECOM to examine the noise and vibration impacts of the construction and operational phases of the proposed bulk fuel facility, as well as the cumulative impacts which may result from each phase of the proposed facility.

The assessment utilised acoustic measurements of residential areas in the vicinity of the proposal to determine the background noise levels. Noise modelling was undertaken for a number of atmospheric and operational scenarios.

The noise and vibration impact assessment concluded that under all scenarios, for day and night activities during both construction and operational phases, there would be no exceedance of the site specific noise criteria.

Traffic and Transport

The proposal would result in the generation of construction traffic over the approximate 14 month expected construction period and daily light vehicle and truck movements when operational. At the peak of construction staff/visitor demand levels are not expected to exceed ten trips and are not likely to have an adverse impact on the road network.

During operation of the terminal facility, daily traffic movements will consist of fuel tanker deliveries and the movements of employees and visitors. Estimated truck movements when the terminal facility is operating at start up will be in the order of 36 B-double (from 18 trucks), and 20 light vehicles (from 10 light vehicles) per day for dispatch and delivery of fuels, and staff movements.

Ship movements will be in the order of 8 vessels per year for imports of fuels.

Visual

The overall character of the area surrounding the Site is industrial. The Steelworks area is on low-lying land adjacent to the Hunter River and there are few vantage points that overlook the Site. Generally, the Facility would add industrial infrastructure, typical in character to the existing area, to the foreshore of the Hunter River at the former BHP Steelworks Site.

The industrial area is not readily accessible, physically or visually from residential areas. Along Industrial Drive, land is more elevated. However, views of the Site are currently largely obstructed owing to topography, buildings and intermittent vegetation. Industrial Drive at is approximately 800 m from the Site. The other well-trafficked publically accessible road from which views to the Site are possible is Cormorant Road on Kooragang Island. Cormorant Road is approximately 600 m from the Site at its closest point.

A number of measures would be taken to ensure the visual impacts do not encroach on the amenity of the area. These would include keeping the Site in a neat and tidy condition during construction, completing construction within a reasonably short time frame, and landscaping the car park and office/workshop area with shrubs and trees.

The proposal is likely to have minimal impact on the visual amenity of the area. This facility is located in an area that is industrialised and, subsequently, is consistent with the surrounding environment.

Waste Management

Wastes that would be generated during the construction of the Facility would be primarily associated with materials used in the packaging of plant and equipment to the Site. The Site would not generate a significant amount of waste as a consequence of its operation. The Site would generally require two operators onsite, with the exception of ship unloading events.

Waste strategies have been developed for the proposal in accordance with the principles of the *Waste Avoidance and Resource Recovery Act 2001*, which incorporates a hierarchy of waste management: avoidance; reuse; recycling; and disposal.

With the implementation of the appropriate waste management strategies, and the low generation of waste associated with the operation of the Facility, no significant impacts associated with waste are anticipated.

Ecology

The Site is located within 4 km of the Kooragang Island Nature Reserve, which forms part of the Ramsar-listed Hunter Estuary Wetlands. The wetlands are an important area for migratory and Australasian wetland species, including species protected under the Agreement Between the Government of Japan and the Australian Government for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA) and the Agreement Between Australia and the People's Republic of China for the Protection of Migratory Birds and Their Environment (CAMBA).

Flora and fauna, populations and ecological communities are known or predicted to occur within 10 km of the Site with the key findings were as follows:

- Fourteen threatened flora species have been identified as having been previously recorded or predicted to occur within 10 km of the Site.
- One threatened ecological community has been identified as being predicted to occur within 10 km of the Site.
- Forty-five threatened terrestrial fauna species have been identified as having been previously recorded or predicted to occur within 10 km of the Site.
- Two populations of threatened terrestrial fauna species have been identified as having been previously recorded or predicted to occur within 10 km of the Site.
- Twenty-seven threatened marine and migratory marine species have been identified as having been previously recorded or predicted to occur within 10 km of the Site.
- One threatened migratory marine species has been identified as having been predicted to occur within 10 km of the Site.

The Site has been highly disturbed by historic industrial activities and, as such, does not contain habitat value for native species. A visual inspection of the Site indicates that there is no vegetation present on the Site. It can therefore be concluded that none of the above species or their habitats occur. The Proposed Project incorporates measures to reduce offsite impacts and it is, therefore, unlikely that the works would affect the Hunter River or other native flora and fauna in the areas surrounding the Site.

The Proposed Project is not anticipated to have a significant impact on any of the eight matters of National Environmental Significance. Whilst the Site is located within 4 km of the Kooragang Island Nature Reserve (a Ramsar listed wetland), it is predicted that the Proposed Project would not impact on this protected area.

Indigenous Heritage

No Indigenous heritage sites have been recorded or discovered on the Site to date. It is presumed that any Indigenous heritage if present in the vicinity of the Site would have been removed or destroyed during previous reclamation, construction and operational activities. Impacts to Indigenous heritage by the Proposed Project are thus considered to be negligible. In the unlikely event that objects are discovered in the natural soil profiles, works would temporarily cease and a qualified archaeologist and representatives of Aboriginal community groups would be consulted.

Non-Indigenous Heritage

There are numerous non-Indigenous heritage items listed in the vicinity of the Site. The majority of these are historically linked to past industrial uses of the land.

As part of the development application for the redevelopment of the former Steelworks Site an Archaeological Management Plan (AMP) was prepared by EHE Architecture and Umwelt (Australia) Pty Ltd in July 2001. The AMP defines the nature, location and strategic management of archaeological resources on the former Steelworks Site during and after demolition. Fourteen heritage sites in the vicinity of the Site have since been demolished, after proper heritage resource records were made.

Heritage resources that were to be maintained on the former BHP Steelworks Site for development of an interpretation facility were the archaeological site of the Hunter River Smelting Co, the Chief Engineer's Office and the Pattern Store. These resources are nearby, with the closest being approximately 200m. No heritage sites exist

on the Site of the proposed Facility. It is unlikely that the Proposed Project would impact on any of the non-Indigenous heritage items in proximity to the proposed facility.

Other Environmental Considerations

Other issues that were considered included social/economic considerations, utilities and demand on resources. Overall it is considered that the Proposed Project would have positive economic benefits for the Hunter Region through significant capital investment consistent with the Regional Economic Development Strategy. The provision of utilities to the Site would not pose a significant demand on existing infrastructure and resources. The Proposed Project also has the potential to alleviate demand for resources by providing an efficient distribution point for both regular and renewable fuels.

Residual Risk

The Environmental Risk Analysis for the Proposed Project is based on a process adapted from *AS 4369: 1999 Risk Management*, as well as environmental risk tools developed by other organisations.

Residual Environmental Risk (RER) is assessed on the basis of the significance of environmental effects of the Proposed Project and the ability to confidently manage aspects potentially leading to those effects.

The analysis of residual environmental risk for issues related to the propose Project is shown in Section 20.1.This analysis indicates the environmental risk profile for the Proposed Project based on the assessment of environmental effects, the identification of appropriate safeguards, and the Statement of Commitments shown in this EA.

This residual risk analysis indicates that the proposed Facility, including appropriate safeguards outlined in this EA, would give rise to a predominantly low to low/medium risk in relation to the identified environmental issues.

Statement of Commitments

The Statement of Commitments has been prepared in respect of the construction and operation of the proposed Facility and has been compiled on an issues basis, as informed by the EA and the environmental risk analysis. It is anticipated that this would form the basis of the approval conditions for the Facility.

Marstel commits to the preparation and implementation of the environmental management and monitoring plans and environmental mitigation measures detailed in the SoC for the proposed Facility. These include:

- Construction Environment Management Plan (CEMP)
- Port Operation Management Plan
- Wharf Emergency Response Plan (WERP)
- Site Management Plan.

Routine monitoring of infrastructure condition, groundwater and surface water would form a component of the SMP.

Consistency with Mayfield Concept Plan

The proposed bulk fuels facility sits within a larger area to which the Port Terminal Facilities at Mayfield Concept Plan (09_0096) applies. This Concept Plan application is currently at the assessment stage with the NSW Department of Planning and Infrastructure. The Concept Plan environmental assessment included provision for a bulk fuels facility similar to that proposed in this document however with approximately double the proposed throughput of fuels.

This Proposal has been designed having regards to the outcomes of the Concept Plan. As no Concept Plan approval was issued at time of writing, a comparison of the proposal in regards to the Statement of Commitments provides in the Concept Plan has been undertaken in Section 22.0 of this report.

It has been concluded that the Proposal is consistent with the Concept Plan as proposed. Upon approval of the Concept Plan, this Proposal will be reviewed for consistency. This has been committed to in the SoC.

Proposal Justification

The assessment of the proposal undertaken in the preparation of this EA has incorporated biophysical, economic and social considerations. The potential biophysical impacts associated with the Proposed Project include:

- Ecology
- Surface water quality
- Groundwater
- Soils and acid sulfate soils
- Air quality and odour
- Noise and vibration
- Waste management.

The assessment of the impact of the Proposed Project on each of these biophysical elements has concluded that, provided appropriate mitigation and management measures are implemented, the Proposed Project would not have a significant impact and is therefore justifiable on environmental grounds.

The potential effects of the Proposed Project on social and cultural aspects of the area were examined in this EA and included consideration of:

- Hazard and risk
- Traffic and transport
- Indigenous and non-Indigenous heritage
- Visual amenity.

The assessments of each of these factors have shown that the Proposed Project would not have a significant impact provided that the appropriate management and mitigation measures are implemented as identified in this EA, and that the Project avoids undue effects and is consistent with existing and planned land uses. Furthermore, the Proposed Project is considered to be in accordance with both the current and future consumer demand for diesel and biofuels in the region

The proposed development would provide economic benefits to the local, regional and State economies. While the construction phase of the development would provide local employment opportunities and revenue for the Newcastle area, the operational phase would provide economic benefit to consumers in the Hunter Region through introducing greater competition in the fuel market, which may result in lower fuel prices. The proposed project is, therefore, considered to be justifiable from the economic perspective.

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1.0 Introduction

1.1 Purpose

This Environmental Assessment (EA) has been prepared by AECOM Australia Pty Ltd (AECOM) on behalf of Marstel Terminals Pty Ltd (Marstel) for the proposed construction and operation of a bulk liquids storage facility (Facility). The proposed terminal facility would be located on a parcel of land within an area managed by the Newcastle Port Corporation (NPC) in the Port of Newcastle, NSW as part of the Mayfield Concept Approval Site. This Site is formerly part of the BHP Steelworks Site and is currently subject to concept approval submission number 09_0096 by the NPC (the Mayfield Concept Approval Submission). The proposed facility would be used to receive, store and distribute diesel fuels for customers throughout the Hunter Region. The capital cost of the proposed facility is approximately $30 million.

Marstel is seeking Project Approval for the proposed Facility under the *Environmental Planning and Assessment Act 1979* (EP&A Act). As such, an EA is required to be submitted by Marstel to the Minister for assessment. The Director-General of the DP&I has issued Environmental Assessment Requirements (EARs) for the proposal, which provide the framework for this EA.

It is pertinent to note that this Project Application 08_0130 is being run concurrently with NPC's Mayfield Concept Approval Submission (09_0096). The Mayfield Concept Approval Submission relates to a larger area of land which would contain an array of port related facilities, and not just a bulk fuels facility. This Project Application, however, provides a direct development pathway solely for the Marstel Facility.

1.2 Background

Fuel consumption is increasing throughout Australia and there is a strong shift to utilise biofuels as a renewable source. Existing and proposed urban and industrial activity throughout the Hunter Valley has increased the demand for fuels, thus improved accessibility to a range of suppliers is significant for the sustained growth of the region. Refining capabilities in Australia are operating at maximum production; therefore the increasing demand for fuel would need to be met through imports, which are received via ship freight. This would in turn require waterfront terminal facilities.

The existing fuel terminal facilities in Newcastle receive fuel via truck or pipeline from Sydney. Vehicle access from fuel refinery facilities in Sydney is via the F3 Freeway, and is limited by route restrictions for hazardous bulk liquids. The fuel pipeline from the facilities in Sydney is currently at capacity. The alternative mode of supply to Newcastle facilities is via ship. The proposed Facility would provide for storage of diesel and biodiesel with the ability to provide an approximate equal throughput of both these fuels based on demand.

Biofuels are generated from renewable, organic sources. In Australia, the two primary sources of biofuels are ethanol and biodiesel. This is primarily due to availability of conversion technologies and proximity to feedstock availability. Biodiesel is produced through a process known as transesterification, where organically derived oils are combined with alcohol (usually ethanol or methanol), and are chemically altered to form fatty esters. When these esters are used for fuel, they are called biodiesel.

The use of fuels blended with biofuels can result in environmental benefits, including reduced exhaust emissions of some toxic pollutants and reductions in greenhouse gas emissions. Biodiesel is biodegradable, requires minimal engine modification, and is cleaner burning than the diesel it replaces. There has been significant support from the Federal government to the biofuels industry with the introduction of an excise scheme and the establishment of a Biofuels Taskforce. Within NSW, legislation has been gradually increasing the percentage of biofuels which retailers are required to provide for consumers as part of the State's overall fuel mix. The aim of these schemes is to increase consumer confidence with the products and improve distribution to customers. The provision of terminal facilities for the storage and distribution of diesel and biofuels within the Hunter Region would assist in delivering these objectives for biofuels consumption.

Marstel have previously gained project approval for the same development at a different site on Kooragang Island (KI), NSW. However the Site now proposed in Mayfield offers significant advantages to the previous site, including improved access to port and pipeline infrastructure. This proposal also differs from the original approved KI proposal, as there are no plans to store unleaded petrol on the current Site.

1.3 Project Summary

The proposal is for the provision of a bulk fuels terminal which would comprise:

- Use of an existing ship berthing facility via Berth 4 (M4) to deliver fuels from bulk tankers. Fuel to be pumped along a new 300 mm diameter steel pipeline from Mayfield M4 to the Facility.
- Storage of bulk fuels in above ground tanks.
- Distribution of fuels by road tankers. Ancillary components including site office, car parking and truck loading gantry.
- Construction access to the Site via Selwyn Street and operational access via Ingall Street, according to a deed of agreement between Marstel and NPC. NPC would aim to have the operational access route completed by the time that the proposed Facility begins operations. However the construction access route may be utilised during the initial operational phase of the Facility if the permanent operational access route is not yet finalised (refer Section 3.3).

The terms of the deed of agreement between Marstel and NPC agree that NPC undertake construction of intersections, access ways and services to the Site boundary. Any approvals that would be required for these road works would be sought and obtained by NPC. Marstel is not itself seeking approval for these works as part of this application.

1.4 Location

The Facility would be located on part of NPC's Mayfield Concept Approval Site, approximately 5 km north/west of the Newcastle CBD as shown in Figure 1. The land on which the facilities are to be located would be leased from NPC.

The nearest residential area is located at Mayfield (see Figure 2), with the closest receptors approximately 900 m from the proposed Terminal Site. Neighbouring industry within the port precinct includes OneSteel and Koppers Coal Tar Products to the west.



G:\Projects\602 Projects\60212465 Marstel Terminal REF\FIGURES\60212465 F1 Regional Context 06 10 2011 TO

AECOM

REGIONAL CONTEXT

Environmental Assessment
Port of Newcastle, New South Wales

FIGURE 1



G:\Projects\602 Projects\60212465 Marstel Terminal REF\FIGURES\60212465 F2 Site Location 06 10 2011 TO Rev A

AECOM

SITE LOCATION

Environmental Assessment
Port of Newcastle, New South Wales

FIGURE 2

1.5 The Applicant

Marstel is an independent bulk liquids storage and handling company, which specialises in handling hazardous bulk liquids and edible oils. Marstel has gained a reputation for excellence in the storage and handling of bulk liquids and is seeking to diversify into the fuel terminals sector in order to grow its business base. Marstel has been operating since 1987 and is a national leader in the business of bulk liquid storage, with a highly valued customer base, including numerous multi-national companies. Marstel currently operates nine terminals in Australia and New Zealand.

Marstel places the highest priority on safety, operational integrity and good environmental practice. Documented work procedures and management systems have been developed for all of Marstel's terminals to ensure its operations are conducted safely. The Coode Island facility (Melbourne) has been recognised as a "World Best Practice" operation for safety and environmental protection, being awarded the Plastics and Chemicals Industry Association (PACIA) Award for Sustainability in 2006. Operator selection and training, emergency response procedures, risk management procedures and incident reporting are all key areas of emphasis in Marstel's management systems, which support the company's quality, safety and environmental objectives.

1.6 The Environmental Assessment Process

1.6.1 Major Projects

The EP&A Act and its Regulation provide a framework for the environmental planning process in NSW. Under the former Part 3A of the EP&A Act, section 75B(2) made provision for 'major projects' to be identified through various means, including by way of a declaration of a listed project in State Environmental Planning Policy (Major Development) 2005 (Major Development SEPP).

Schedule 1 of Major Development SEPP identified classes of development which are candidates for declaration as major projects. Schedule 1 included works for the purpose of bulk liquids storage facilities with a capital investment of more than $20 million. This proposal is to store bulk liquids at the Port of Newcastle, with a capital investment of approximately $30 million.

On 21 December 2007, Marstel received Project Approval from the DP&I under Part 3A of the EP&A Act for a bulk liquids storage facility on Kooragang Island (KI) (Project Approval 07_0044). For reasons outlined in Section 3.2.1, a decision was subsequently made by the proponent to seek Project Approval for a facility on the Mayfield Concept Approval Site instead.

On 29 May 2008, notification was provided to Marstel that the project at the Mayfield Concept Approval Site would also be considered by the Minister for Planning (the Minister) as a Part 3A Major Project (Project Application 08_0130). At that stage, the scope of operations that was proposed to take place at the Facility was different to that which is currently proposed. Originally, it was proposed that the Facility would receive, store, blend and distribute fuels and biofuels, including petrol, ethanol, diesel and biodiesel. The current proposed Facility would facilitate diesel and biodiesel only, and would not provide for the actual blending of fuels. Marstel is seeking Project Approval for this updated scope of proposed operations at the same location, on the basis of the original notification from the Minister that the project has been declared as a 'major project' under Major Development SEPP. This is still considered as Project Application number 08_0130.

Part 3A of the EP&A Act, and relevant provisions of the Major Development SEPP, have since been repealed. However, as the Project received declaration from the Minister that it was a major project before 1 October 2011, the transitional arrangements provide for the former Part 3A provisions to continue to apply to the Project. In accordance with the provisions of the former Part 3A of the EP&A Act, Marstel are therefore seeking Project Approval for the proposed bulk liquids storage facility. This includes the delivery of the fuels via ship berth and a pipeline from the wharf to the facility. The Minister is the approval authority for this application.

1.6.2 Environmental Assessment Requirements

Requirements that are to be met for the Project Approval are detailed under the provisions of Section 75F of the EP&A Act. These requirements include the preparation of an EA in accordance with the Environmental Assessment Requirements (EARs) of the Director General of DP&I.

An Environmental Assessment Scoping Report (EASR) was prepared by AECOM (formerly ENSR) in May 2008 and submitted to the DP&I in relation to Project Application 08_0130. The EASR identified the significant environmental issues that should be addressed by the assessment process. On 7 July 2011, the Director General issued updated EASRs for the proposed Facility which take into consideration the amended scope of activities

that are proposed to take place at the Facility. These EASRs are discussed further in Table 4, and are provided in full in Appendix A.

1.6.3 EA Exhibition

Section 75H of the EP&A Act requires that the EA be placed on public exhibition for review for a minimum period of 30 days.

2.0 The Site and Context

2.1 Site Description

The proposed terminal facility would be located on vacant land in NPC's Mayfield Concept Approval Site, approximately 5 km northwest of the Newcastle CBD. The land on which the facility is to be located would be leased from the NPC. The proposed terminal facility is situated opposite established industries on Kooragang Island and the topography is essentially flat near the western bank of the Hunter River. The Site lies at approximately 1.9 m AHD and abuts the south arm of the Hunter River to the north and adjoining industry to the west as indicated in Figure 2. The Site is located within the Port of Newcastle, and the area surrounding the proposed facility is characterised by a mixture of port related activities, industrial uses and residential and commercial areas. The neighbouring industrial land users include OneSteel and Koppers Coal Tar Products to the west.

In a regional context, the Site would be located within the Port of Newcastle, which is a major distribution point and activity centre for a number of industries. Whilst the export of coal is the predominant commodity shipped through the Port, other cargoes such as fertilisers, vegetable oils, grains, woodchips and aluminium also have a significant contribution. The Port of Newcastle also supports other industries such as ship building and repairs in the Marine precinct. The Port is also becoming an increasingly popular location for pleasure craft, particularly with the establishment of the Newcastle Cruising Yacht Club in Wickham.

2.2 Site History

The proposed terminal facility would be located on part of the former BHP Steelworks Site. BHP was located on the Site from 1915 to 1999. In July 2002, ownership of that part of the former Steelworks Site known as the Closure Area Site was transferred to the State Government. In March 2007, the Hunter Development Corporation (formerly the Regional Land Management Corporation Pty Ltd (RLMC)) was created by the Government to manage the day-to-day activities of former BHP and other Crown lands in the Lower Hunter Region, including remedial and redevelopment works for the Closure Area Site (SKM 2004).

On 14 June 2001, under former Section 21 of the *Contaminated Land Management Act 1997* (CLM Act), the Environment Protection Authority (now part of the NSW Office of Environment and Heritage: OEH) declared the Closure Site to be a remediation site. A Remediation Action Plan (RAP) was prepared by SKM in 2004 to address contamination issues associated with soils and groundwater. A Voluntary Remediation Agreement (VRA No 26025) for the remediation of the Site was issued by the Environmental Protection Authority (EPA) on 30 August 2005. Hunter Development Corporation (HDC) has undertaken to fulfil these remediation commitments. For the purposes of remediation, the Closure Site has been delineated into two distinct areas (refer Section 10.1 for more detail):

- Area 1: This is the inner area bounded by the subterranean barrier wall and the Hunter River, and is approximately 30 ha.
- Area 2: This is the remainder of the Mayfield Concept Approval Site, outside of the subterranean barrier wall.

In March 2008 a Contaminated Site Management Plan (CSMP) for the Intertrade Industrial Park and the Closure Area of Former Steelworks Site Mayfield was prepared by HDC. The CSMP provides a common framework to be applied across the whole of the Site for the design, implementation, completion, use and maintenance of remediation and project works. HDC is reliant on other land owners, agents and occupiers to enforce the conditions of the CSMP. Thus, Marstel would be required to abide by and enforce the conditions of the CSMP. As outlined in Section 3.5.3 and Table 19, the Proposed Project is considered to be generally consistent with the aims of the CSMP.

In mid 2008, HDC completed Stage 1 of the remediation works (refer Figure 2). Stage 1 dealt with the majority of contamination risks located within Area 1, and included the following activities:

- The construction of an underground barrier wall to three sides of Area 1. The barrier walls lie up to 49 m deep and 1.5 km long, and function by reducing groundwater flow to the Hunter River.
- The placement of low permeability capping (10^{-9}m/s) to reduce the infiltration of groundwater.
- The construction of new major stormwater drains at the east and west ends of the site.
- Associated demolition, landforming and environmental works.

Stage 2 of the remediation works is currently underway (refer Figure 2), and is planned for completion in Q1 2013. Stage 2 activities involve further capping, land forming and surface drainage works. Stage 2 would not involve further remediation works to the Intertrade area, which is currently proposed to be remediated by Intertrade in line with proposed future development (HDC, 2010). As shown in Figure 2, portions of both Areas 1 and 2 are proposed to be subject to Stage 2 works. However, Stage 2 Remediation Area, Area D works have almost been completed. For this reason it is not expected that the Stage 2 remediation works in the Proposed Project area would significantly hinder the planning, construction or operational phases of the Facility. Marstel would undertake close consultation with HDC in relation to its Stage 2 remediation activities to ensure both parties have site access when required.

More recently the Hunter River Remediation Project (HRRP) has been undertaken by BHP Billiton. This has involved the dredging and on-shore treatment of contaminated sediments in the Hunter River at Mayfield Berths 1 and 2. The sediment removal work is likely to be completed by mid 2011 with remediation of the Site completed by 2012.The HRRP might therefore create a slight encumbrance to Marstel's construction program. However, this would only be temporary and would not extend over the life of the proposed Facility.

2.3 Surrounding Land Use

The surrounding land use is industrial development, which is indicated in Figure 2. The surrounding land uses include:

- North – Hunter River and Port Waratah Coal Services Coal Loaders.
- South – Currently vacant land which would be developed as part of the Intertrade Industrial Park.
- West – One Steel operations.
- East – Current vacant industrial land (future container terminal) and Koppers Australia pipeline.

The nearest residential area is located at Mayfield (see Figure 2), with the closest receptors approximately 900 m from the proposed Terminal Site. Other residential areas in proximity to the Site include Carrington, Wickham and Tighes Hill.

2.4 Land Ownership and Legal Description

The land to which this proposal is associated is identified in Table 1, as part of Lot 33, DP 1116571. This Lot is proposed to be subdivided, after which the Facility would be located on part of new Lot 3 (refer Figure 3).

The locations of surrounding landowners is depicted in Figure 2.The terminal facility is to be located in the bulk liquids precinct of NPC's Mayfield Concept Approval Site. Marstel currently have an agreement in place with NPC for the lease of the Site. The area comprising the Hunter River, which is adjacent to the Site, is under the ownership of NSW Maritime. These areas would not be impacted on by the proposed Project.

Table 1 Land Ownership Details

Land Description	Land Owner
Part of Lot 33 DP 1116571 (part of Lot 3 of DP 116571 once proposed subdivision is complete)	Newcastle Port Corporation (Under delegation from the State Property Authority)



G:\Projects\602 Projects\60212465 Marstel Terminal REF\FIGURES\60212465 F3 Proposed Subdivision 01 11 2011 TO

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PROPOSED SUBDIVISION OF LOT 33 DP1116571

Environmental Assessment

Port of Newcastle, New South Wales

FIGURE 3

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3.0 Project Description

3.1 Project Need

3.1.1 Purpose

The purpose of the Project is to develop a world-class bulk diesel and biodiesel terminal in Newcastle. The Facility would assist industries in the Hunter Region to grow with more cost-competitive fuel, greater efficiencies and a stable fuel supply. Marstel's vision is to contribute towards a secure, thriving and vibrant Hunter community built on an economically, socially and environmentally sustainable industry base.

3.1.2 Australian Fuel Demand Trends

Australia is an energy rich nation, and one of the few Organisation for Economic Co-operation and Development (OECD) countries that are net energy exporters, with the exception of liquefied fuels such as gasoline, diesel and fuel oils. Australia has numerous off-shore and on-shore refining capabilities in areas such as the Carnarvon Basin, Gippsland Basin and Bass Strait. There are seven major oil refineries in Australia operated by the four major oil companies BP, Caltex, Mobil and Shell. Distribution of bulk fuel from the refineries is typically by ship.

Australian production of crude oil, condensate and LPG is projected to decline by 2% per annum until 2029-30 whilst the consumption of crude oil and its products is expected to increase by around 1.3% per year (ABARE 2010). The result of this is that net imports of oil and oil products are projected to account for 76% of consumption by 2029-30. Since the mid 1990s the imports of fuels from the Middle East to Australia has fallen, and has been replaced by fuel imports from the South East Asian region.

The transport sector consumes 70% of liquefied fuels in Australia. Assuming that fuel prices remain relatively consistent, it is predicted that this would continue to increase by 5% by 2029-30 (ABARE 2010). Diesel to be stored and handled at the proposed Facility would be sourced through both domestic and offshore markets.

3.1.3 Demand for BioFuels

An important component of the Proposed Project is for the storage and distribution of biofuels. Biofuels are generated from renewable, organic sources. In Australia, the two primary sources of biofuels are ethanol and biodiesel, due to availability of conversion technologies and proximity to feedstock availability. The use of fuels blended with biofuels can result in environmental benefits, including reduced exhaust emissions of some pollutants and reductions in greenhouse gas emissions. These environmental benefits would assist in achieving sustained growth options in Australia.

The Australian Federal Government has commissioned a number of reports into the biofuels industry since 2000. These have looked at the costs and benefits of biofuels to the consumer. In 2001, the Government announced a biofuels target of 350 ML to be included in the Australian fuel mix by 2010.

A biofuels taskforce was established in 2005 to ensure that public policy was aligned with existing scientific evidence. In summary the Biofuels Taskforce concluded that:

- There were potentially significantly greater health benefits from ethanol use (in biofuels) than previously thought.
- Greenhouse and regional benefits from the use of biofuels were similar to previous research undertaken.

Nevertheless, it was also concluded that there were market barriers for biofuels and the target of 350 ML biofuel produced by 2010 was not achieved. Currently, the Australian Federal Government does not have a specific policy plan for biofuels, apart from broader policy commitments to allocating funding towards emerging renewable energy technologies through its new *Emerging Renewables* Program. The Program aims to deliver support for cutting edge technologies which offer significant potential for future sources of large-scale base load power (Julia Gillard and Labour, 2011).

In 2009, amendments to the *Biofuels Act 2007* provided that 2% of all diesel fuels sold in NSW must be biodiesel. This requirement is currently set to increase to 5% of all diesel fuels sold in NSW as of 1 January 2012.

There is thus an increasing requirement for primary wholesalers and primary retailers to supply biofuels. The provision of terminal facilities with a clear goal to store and distribute biofuels would improve the volume and accessibility to and volume of the product. Thus the Project would aid in delivering national policy and state legislative requirements for improved viability of the biofuels industry. The proposed Facility would dedicate

approximately 10-20% of its storage capacity to biodiesel. However, due to the frequency with which biodiesel would be received to and dispatched from the Site, approximately 50% of the Facility's total annual throughput in 2013 would be biodiesel. Indeed, it is projected that the. Marstel anticipates that subsequent to 2012 operations, it may seek approval to expand the initial operations of the Site to a total throughput of 600 ML of diesel and biodiesel by 2016.

There is also additional vacant land on the Mayfield Concept Approval Site which could potentially be utilised to store greater amounts of fuels in the future as the demand for a variety of fuels increases. This would likewise involve an application to amend any existing development approvals.

3.1.4 Demand for Bulk Fuel Storage in Hunter Region

Fuel demand in the Hunter Region is likely to grow. Both population and industrial growth have been targeted for the region. The Lower Hunter is the sixth largest urban area in Australia and one of the State's major centres of economic activity indicating high demand for fuels. Similarly, strong mining and agricultural sectors in the upper Hunter Region indicate increasing demand for transport and associated fuel consumption. The NSW Government has produced a Lower Hunter Regional Strategy (LHRS) which has been prepared to ensure the region develops in a strong and sustainable way. The NSW Government's 25-year land use strategy for the region includes:

- Provides a projected population growth of 160,000 people.
- Plans for up to 66,000 new jobs and ensures an adequate supply of employment land.

Existing delivery of fuels to the region by road and pipeline from Sydney are limited by capacity and cost. Provision of storage and distribution facilities in Newcastle would enable links to free-flowing transport distribution in the region which offers importers and exporters a seamless delivery network to and from the Port of Newcastle. This meets the objectives of the NSW Premier's State Renovate Infrastructure policy for the region.

It is anticipated that the Proposed Project would secure the availability of renewable and cost effective fuel for the region which would assist in meeting the objectives for a sustainable and strong region.

3.2 Alternatives

3.2.1 Site Location

A successful bulk terminal facility for fuel requires the following site criteria:

- Access to existing port infrastructures and availability of land close to international berthing facilities.
- Wharfage to cater for ships up to 230 m long to berth and transfer the fuels/biofuels along a short pipeline into the tanks.
- Easy and safe road transport access from the Site for fuel delivery.
- Large population base and predicted population and economic activity growth (strong market for fuel).
- Complementary surrounding land use to limit hazard risk and impact.
- Suitable physical site characteristics to limit construction costs and environmental risks.
- A supportive business development environment.

The Sydney, Hunter and Illawarra regions have international berthing facilities. The Sydney region suffers from congested roads, limited transport routes for liquids with low flash points (such as fuels) and a lack of vacant land close to the port facilities. The Illawarra region faces similar road distribution problems and has a smaller population and industrial base. Newcastle was chosen as the location for the proposed facility due to commercial and access benefits and its proximity to the Hunter market.

The proposed terminal facility would be located close to a berthing facility, and can receive and distribute product directly from the ship via a short pipeline. The ability for Marstel to receive product from ships and supply this product to end users would provide a cost-effective supply chain that would provide future growth opportunities for the terminal once it is established.

Development consent was granted to Marstel in December 2007 to operate the facility on a site located on KI (Project Approval 07_0044). The proposed Mayfield Site subject to this application has a number of distinct advantages to that of the KI site, being:

- Marstel can gain direct access to the existing berth located to the east of the Mayfield Site (M4). The former KI proposal involved coordinating unloading not to coincide with Orica's existing loading operations.
- Marstel are able to construct a new above ground pipe work infrastructure at Mayfield in comparison to the underground pipeline required for the previous KI site.
- Public access to the Mayfield site would be limited compared to the KI site.
- The Mayfield site would overall be further removed from residential areas and has lower visibility from public areas.
- Whilst this proposal relies on the use of existing berthing and pipeline infrastructure, there is potential at the Mayfield site for a new permanent berth to be developed, either by Marstel or another party, in closer proximity to the site. Such a new permanent berth could only be developed once dredging of the harbour in this vicinity has been complete, and would require a new environmental assessment, or an application to amend an existing project approval.

The 'do nothing' alternative has been considered in the context of the potential impacts and benefits the proposal may generate. Minor environmental impacts will result due to the locating of the facility on already heavily disturbed site in an established industrial area. Appropriate mitigation measures are recommended by this report to minimise the risks and hazards of the proposal (refer Section 4.6) to acceptable levels. These factors coupled with the beneficial environmental (climate change) and socioeconomic factors eliminate the viability of the 'do nothing' alternative.

3.2.2 Site Layout

Bulk Fuel Storage Facility

Tank Farm layout is dependent upon:

- Anticipated volume of delivery (hence tank size)
- Road access
- Physical site constraints
- Visual impacts
- Security.

The proposed tank farm layout is considered optimum for the Site and use. The tank sizes are suitable for the diesel loads delivered by ships (3 x 18 ML diesel storage tanks with approximately 8 shipping deliveries per annum). The proposed tank storage and bunded area would be located upstream of the existing groundwater barrier wall further explained in Section 10.1.

Marstel would construct their facility on part of Lot 33 DP1116571. This would provide for future expansion into Lot 1, located north and adjacent to Lot 2 along the Hunter River, once a new permanent berth has been constructed.

Fuel Pipeline

The fuel pipeline would carry diesel and from the Mayfield M4 to the Site over a distance of approximately 1,000 m. The pipeline would be constructed above ground on pipeline supports. The advantage to this is that inspection of the pipeline can be readily and frequently undertaken. Above ground construction is common for facilities of this type.

Marstel would also utilise existing pipeline supports that are currently used by Koppers. This would be an efficient use of existing infrastructure for the interim period between the availability of a new berth closer to the Site.

Marstel would ensure that the pipelines used for fuel transfer:

- Have emergency shut off valves installed which can be operated automatically or by remote actuation button on ship and shore.
- Are fully welded and have been non-destructive tested.

- Are painted to protect against external corrosion.
- Are “pigged” clean after each delivery to extract fuel from the line.
- Are fully inspected and tested with an “intelligent” pig on a regular basis.

3.3 Access and Services

Under a deed of agreement between Marstel and NPC, NPC would provide legal access for Marstel and its contractors to the Site. This provision of access by NPC would include the construction of intersections, access ways and services to the Site boundary, and would form part of NPC’s management of the Bulk Liquid Storage Precinct as part of the broader Mayfield Concept Approval Plan. Marstel has been advised that NPC is currently seeking the required approvals to provide this access. Marstel is reliant on NPC to undertake the necessary construction works to provide site access. The predicted impacts of the Facility on the proposed road upgrades would therefore be assessed when NPC seeks approval to commission these upgrades.

It is anticipated that NPC would provide access to the Site via Selwyn Street during the construction phase of the Facility. This access would run from Selwyn Street, across the Mayfield concept approval site to Mayfield Berth 4, and along the Koppers pipeline easement to the proposed Facility (refer Figure 4).This method of access is proposed for the construction phase, however it may also be used during the early operational stage of the Facility, if the proposed operational access route is not completed.

During the operational phase of the Facility, NPC would provide Marstel and its contractors with access to the Site with a permanent road and services access from Ingall Street, along Steelworks Road and down the eastern side of the Facility (refer Figure 5).



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PROPOSED CONSTRUCTION ACCESS

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FIGURE 4



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PROPOSED OPERATIONAL ACCESS

Environmental Assessment
Port of Newcastle, New South Wales

FIGURE 5

3.4 Project Activities

Marstel is seeking approval for the construction and operation of a bulk fuels terminal (the Facility) which, as outlined in Section 1.3, would comprise the following:

- Use of an existing ship berthing facility via Berth 4 (M4) to deliver fuels from bulk tankers. Fuel to be pumped along a new 300 mm diameter steel pipeline from Mayfield Berth M4 to the Facility.
- Storage of bulk fuels in above ground tanks.
- Distribution of fuels by road tankers. Ancillary components including site office, car parking and truck loading gantry.
- Construction access to the Site via Selwyn Street and operational access via Ingall Street, as per a deed of agreement between Marstel and NPC. The construction access route may be utilised during the initial operational phase of the Facility until the permanent operational access route is completed (refer Section 3.3).

During its initial operation phase, daily road traffic movements would consist of biodiesel tanker deliveries, the dispatch of diesel and biodiesel by fuel tanker, and the movements of employees and visitors. Estimated truck movements would commence with 18 trucks delivering to or dispatching from the Site per day. Ship movements would be in the order of 8 Medium Range vessels per year for imports of diesel. It is anticipated that Marstel may, in the future, seek approval to expand the operation of the facility when throughputs increased.

The terms of the deed of agreement between Marstel and NPC agree that NPC undertake construction of intersections, access ways and services to the Site boundary. Any approvals that would be required for these road works would be sought and obtained by NPC. Marstel is fully reliant on such approvals being granted to NPC, and is not itself seeking approval for these works as part of this application.

The site of the proposed Facility is also currently subject to the Mayfield Concept Plan Approval Submission (refer Section 3.7). That Concept Plan would allow NPC to oversee detailed planning of the land uses within the five precincts identified within the Concept Plan. The Marstel Facility would be located entirely within the Bulk Liquid Storage Precinct of the Concept Plan. The Concept Plan is ancillary to this EA. Section 22.0 and Table 48 of this EA provide an overview of how the proposed Facility is compatible with that Concept Plan.

3.4.1 Fuel Delivery by Ship

Marstel is seeking approval for its Facility to receive diesel delivered by ships which would be unloaded at M4, located approximately 1 km east of the terminal. From M4, this diesel would be transported to Marstel's proposed three diesel storage tanks via pipeline. It is anticipated that there would be approximately eight shipments per year for the delivery of diesel in 2013. The Facility would have capacity to store a maximum storage capacity of 54 ML at any one time. Marstel is therefore seeking approval for a total throughput of diesel and biodiesel per annum of 300 ML in 2013 (approximately 264 ML of diesel and 36 ML of biodiesel). It is anticipated that Marstel would, in the future, seek a further approval to expand the operation of the Facility to a 600 ML per annum diesel throughput, however such plans do not form part of the current EA.

Vessels up to Medium Range size (ships with a 25,000-45,000 Deadweight tonnage) would be received at the wharf for diesel import. All deliveries via ship would be undertaken in accordance with a Port Operations Management Plan (refer Sections 3.6.6 and 21.3). It is expected that biodiesel from domestic sources would be delivered to the terminal by road.

Bulk liquid tankers would enter the Hunter River from other ports in Australia and overseas. Once the tanker approaches the port, it would be met by Newcastle Port Pilots, who would assist the tanker navigate entry to the Newcastle Port. As the tanker approaches the wharf it would be assisted by Newcastle Harbour Tugs which would assist the ship to berth, following strict ISGOTT procedures.

The transfer of liquids from ship to the Facility would begin at the shipside transfer manifold system where a pump and transfer pipe attached to the ship's tanks would be activated. Two valves would be installed here, both being manual isolation. The ship's operator would be adjacent to the pump emergency shut-down button during transfer. This transfer manifold system would pump diesel at a maximum of 9 bar pressure, and at a rate of approximately 1,000t/hr through two 200 mm flexible hoses connecting to the wharf pipeline. These 200 mm hoses would be made from steel reinforced rubber and would be monitored during operation according to the *Australian Code for the Transport of Dangerous Goods by Road and Rail* (Federal Office of Road Safety, Canberra, 1998) (ADG). These hoses would be rated for 14 bar working pressure. However, the hose burst pressure is approximately five

times the shipping pressure of 9 bar. The connections at each end of these flexible hoses would incorporate inline butterfly valves to prevent discharge when the hoses are disconnected.

The pipeline for diesel transfer would lie above ground between M4 and the Facility, underneath an existing gantry. The pipeline would be 300 mm in diameter and fully welded along its length. “This pipeline would follow the route of the existing Koppers pipeline, running west from Mayfield M4 to the Facility.

After the ship has established connection to the wharf fittings and the valves have been configured, the ship pump would be started. Flow and tank levels would be continually monitored by ship and shore monitoring and control systems to ensure the fuel transfers successfully. Fuel transfer would typically be undertaken over a 36 hour period.

Once the diesel transfer is completed, the ships pumps would be stopped. The 200 mm flexible hose would be drained to the wharf pipeline and the inline butterfly valves closed to isolate any product remaining in the hose, eliminating minor spills at the connection point. The 300 mm pipeline would then be “pigged” clean to transfer fuel remaining within the pipeline to the diesel storage tanks. This involves passing a solid plug through a pipeline. The plug is small enough to pass through the pipeline but large enough to touch the inside wall, therefore ensuring that all product is cleared from the line once fuel unloading has ceased. The pipeline infrastructure from the ship end (i.e. hoses and pig launcher) would be removed after each receipt, leaving the wharf area clear.

Transfer operations and tank filling would be controlled from a central control room at the Facility. The control room would contain a computer system to monitor diesel tank levels and pipeline flows. Mimic screens would be installed in the control room to assist operators monitoring.

3.4.2 Fuel Delivery by Road

Biodiesel would be delivered by truck to the facility. It is anticipated this element of activity would involve approximately two truck deliveries each day, typically between the hours of 7:00am and 4:00pm on weekdays during 2013 and 6.00am to 12.00pm Saturdays. Each truck delivery would be pumped into the 500m^3 biodiesel tank. It is therefore expected that in 2013 the Facility would have a total annual throughput of 300 ML of diesel and biodiesel in total. It is anticipated that Marstel would, in the future, seek approval to expand the operation of the facility when throughputs are planned to be increased. Road tankers would enter the Site via a driveway from the service road that would be constructed to allow vehicles to access the Site. The service road would join existing roads from Industrial Drive. The tankers would enter a loading bay under the direction of a terminal operator. Once aligned in the bay, tanker brakes would be applied and the appropriate driveway protection initiated (i.e. brake-lock bars on the load points). This would prevent the drivers from leaving the Site whilst still connected to transfer pipework. Earthing connections would also be made to prevent the build up of static electricity during the fuel transfer.

Biodiesel would be unloaded from the tankers at the loading/unloading bays. The control room would contain a computer control system that would monitor the tank levels and pipeline flows. Mimic screens would be installed in the control room to assist operators to monitor terminal operations. The biodiesel storage tank has a maximum capacity of 0.5ML.

3.4.3 Bulk Fuel Storage

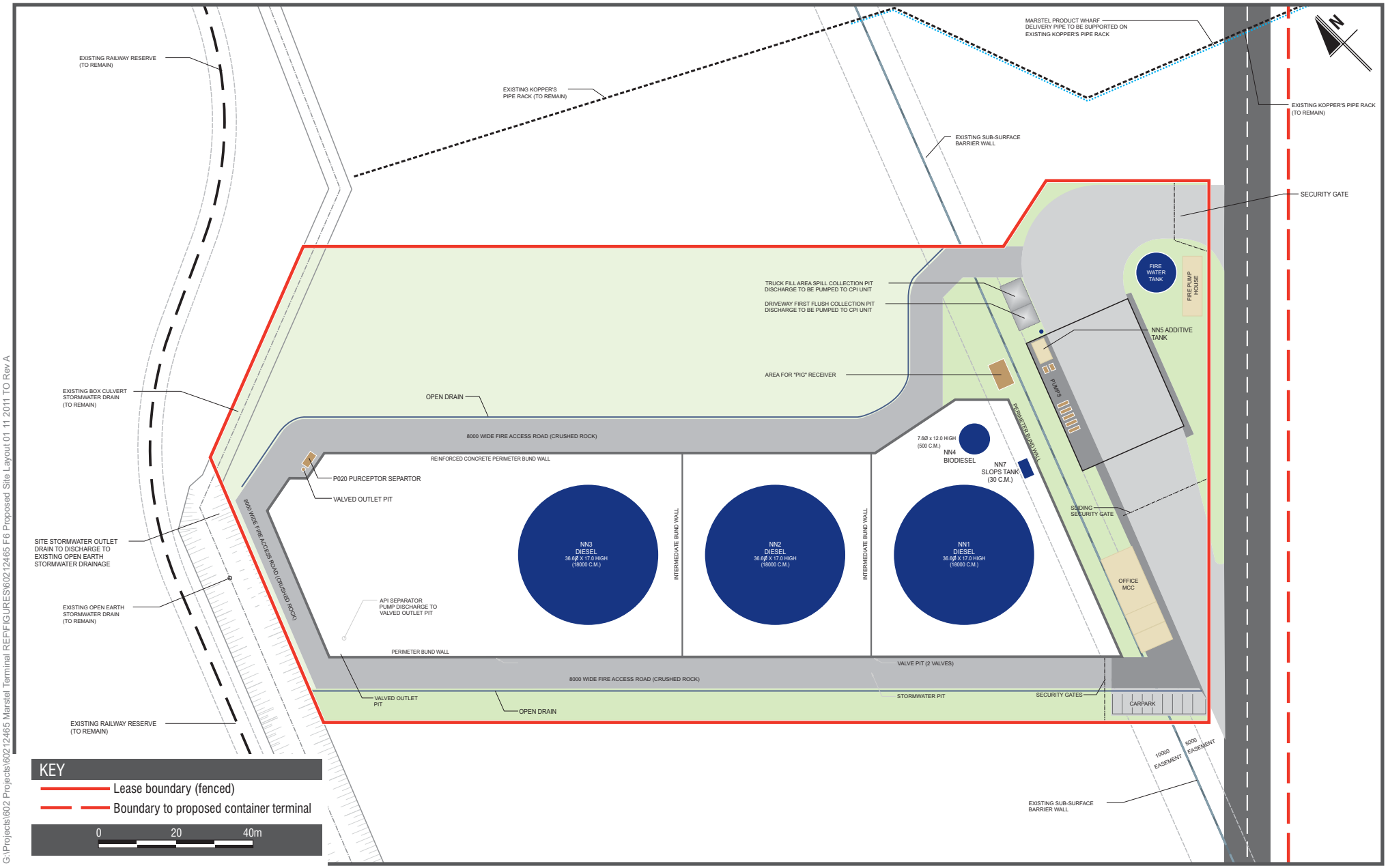
Diesel fuel would be stored in three 18 ML atmospheric welded steel storage tanks respectively, venting to atmosphere. Biodiesel would be stored in one 0.5 ML tank north of NN1 diesel tank. The specifications for each of these tanks is outlined in Table 2, and provided visually in Figure 6.

Each tank would be placed on an elevated foundation. A tell-tale drain would also be installed under each of the tanks for leak detection. All tanks would be located within sealed bunds piped to stormwater collection systems, and would be fitted with a valve so that the bund drain can be isolated in the event of a product spill into the bund As shown in Figure 6, the Site would be surrounded by an approximately 2.5m concrete bund wall, in accordance with *AS 1940-2004 Storage and handling of flammable and combustible liquids* and designed to hold the contents of the largest tank, a 1:20 yr 24 hour rain event and 90 minutes of fire water leaving 100 mm of freeboard simultaneously. There would also be a series of intermediate bunds within the main bund, designed to contain minor spills and stormwater in accordance with AS: 1940. The purpose of these intermediate bunds would be to prevent the whole Site being affected in the event of a leak at the tank/pipework.

When incident rainfall causes bunds to fill, water in the bunds would be inspected for contaminants. Where contamination has not occurred, bund contents would be released to the bund retention pit, then through an American Petroleum Institute (API) separator to the Hunter River.

Tanks would be fitted with:

- Auto-level gauging
- High/low level alarms
- Multi-level temperature measurement
- Multi-level sampling equipment
- Water draining
- Low-level product drains for maintenance purposes.



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PROPOSED SITE LAYOUT

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FIGURE 6

3.4.4 Fuel Dispatch via Road

Biodiesel would be delivered to the Facility by road tanker and unloaded at Bay 3 of the three-bay road tanker gantry proposed for the Facility. The procedures outlined in section 3.4.2 for fuel delivery by road would also apply to diesel dispatch via road. Bays 1 and 2 would be capable of multi-product loading of a 50,000 litre B-double road tanker in 45 minutes. The gantry would be fed from the product tanks via dedicated pumps and lines. Bays 1 and 2 would be fitted with three diesel bottom-loading arms.

The facility would be operated by the vehicle driver using a swipe card gantry access. The vehicle would be fitted with overfill and static protection. A dead-man button requiring regular activation by the vehicle driver would be integrated into the gantry emergency shutdown system. Various component interlocks would ensure safe operation during each phase of the vehicle loading.

Transfer operations and tank filling would be controlled from a central control room at the Facility. The control room would contain a computer system to monitor tank levels and pipeline flows. Mimic screens would be installed in the control room to monitor operations.

The tanker loading operation would be controlled by the vehicle driver using swipe card gantry access. The vehicles would be fitted with overfill and static protection a dead-man button requiring regular activation by the vehicle driver would be integrated into the gantry emergency shutdown system. Various component interlocks would ensure safe operation during all phases of the truck loading. Once tanker filling is complete, the vehicles would leave via the northern driveway.

Flow schematics illustrating how fuels would move through the proposed facility are shown in Plate 1 and Plate 3.

Diesel and biodiesel would be dispatched by road throughout the Hunter Region. The Facility has a proposed maximum throughput of 300ML per annum (264 ML of diesel and 36 ML of biodiesel). The rate at which fuel is dispatched from the Site by road would be contingent on market demand, however it is anticipated that truck dispatch by road would take place 24 hours a day.

3.5 Proposed Development

3.5.1 Fuel Pipeline

Diesel would be delivered to the Facility via a dedicated pipeline that would be used for the import of diesel from ships at M4. The new proposed pipeline would follow the existing route of the current pipeline that is operated by Koppers, as indicated in Figure 6.

The Fuel Pipeline would have a diameter of 300 mm and run over a length of approximately 1000 m.

3.5.2 Tank Farm

The fuel storage tanks would be installed on foundations fitted with tell-tale drains to detect underfloor leaks. The tank storage area would be surrounded by concrete bund walls approximately 2.5 m high, with intermediate bunds 0.6 m high designed in accordance with AS 1940. The bunds would be lined with a Claymax liner and crushed rock, and sealed with a sprayed layer of non-combustible bituminous compound to create a barrier above the soil surface and aid the collection of incident rainfall. Table 2 provides a breakdown of the structures which would form part of this proposed tank farm. Figure 6 provides details of the proposed site layout.

Table 2 Tank farm structures

Structure	Approximate Size	No	Description
Diesel tanks	38 m diameter 18 m high	3	Steel tanks with white exterior
Biodiesel tanks	8 m diameter 12 m high	1	Steel tanks with white exterior
Additive Tank	3 m diameter x 6 m long		Steel tanks with white exterior
Slop Tank	2.6 m diameter x 4.5 long		Steel tanks with white exterior

Structure	Approximate Size	No	Description
Office and amenities	16 m x 9 m 4 m high	1	Steel wall and roof cladding, colourbond finish
Truck-loading gantry	33 m x 16.5 m 6.5 m high	1	Steel frame with colourbond cladding (wall and roof)
Workshop and MCC	11 m x 9 m x 5 m H	1	
Fire water storage tank	11 m diameter 8.5 m high	1	Steel tank with galvanised finish
Fire Pumphouse	15.5 m x 5 m x 5.5 m high	1	Steel frame with colourbond cladding (wall and roof)

3.5.3 Transport Movements

During operations of the terminal facility, daily traffic movements would consist of fuel tanker deliveries and the movements of employees and visitors. Estimated truck movements when the terminal facility commences operations in 2013 would be in the order of 18 B-double trucks accessing the site per day, resulting in 36 daily movements (16 trucks for diesel dispatch and two for biodiesel receipt).Ship movements in 2013 would be in the order of 8 vessels per year for imports of diesel.

3.5.4 Hours of Operation

The Facility would normally be open for product dispatch via road 24 hours per day as required. Marstel seeks approval for 24 hour operations provided that noise levels from the facility meet amenity criteria at sensitive receptor locations. Shipping operations would be undertaken as required, which may be at any time or day of the week, with unloading typically undertaken over a 36 hour period.

3.5.5 Interfaces

The proposed Bulk Fuels Facility would require servicing by various forms of infrastructure such as potable water, electricity, and communications, Wastewater would be managed by an onsite septic system. Under a deed of agreement between Marstel and NPC, NPC would provide legal access for Marstel and its contractors to the Site. This provision of access by NPC would include the construction of intersections, access ways and services to the Site boundary, and would form part of NPC's management of the Bulk Liquid Storage Precinct as part of the broader Mayfield Concept Approval Plan.

It is anticipated that NPC would provide access to the Site via Selwyn Street during the construction phase of the Facility. This access would run from Selwyn Street, across the Mayfield concept approval site to Mayfield Berth 4, and along the Koppers pipeline easement to the proposed Facility (refer Figure 4).This method of access is proposed for the construction phase, however it may also be used during the early operational stage of the Facility, if the proposed operational access route is not completed.

During the operational phase of the Facility, NPC would provide Marstel and its contractors with access to the Site with a permanent road and services access from Ingall Street, along Steelworks Road and down the eastern side of the Facility (refer Figure 5).

As part of the Mayfield Concept Plan, an access and services corridor has been designated near Bull Street for provision of the necessary infrastructure to the various precincts of the Concept Plan area, including the Bulk Liquids Precinct. It is intended that infrastructure in this corridor would service the proposed facility

The Bull St corridor is scheduled to be constructed as part of the initial stage of the Intertrade Industrial Park Development. In the event that these servicing connections are not available to the proposed facility in time for initial operations, alternative temporary connections may be required.

As part of the Concept Plan it was indentified that an alternative utility connection may be available by accessing infrastructure which currently services the adjoining OneSteel site. In addition there is also the ability to provide services through the Selwyn Street Road Reserve which also provides the secondary access option for the site.

Should it be identified that servicing connections are not available through the IIP in a timeframe that meets the requirements of the proposal, further detailed investigations would be made regarding alternative options, taking into consideration the ongoing development of the area. These additional investigations would include consultation with service providers and adjoining landowners as necessary.

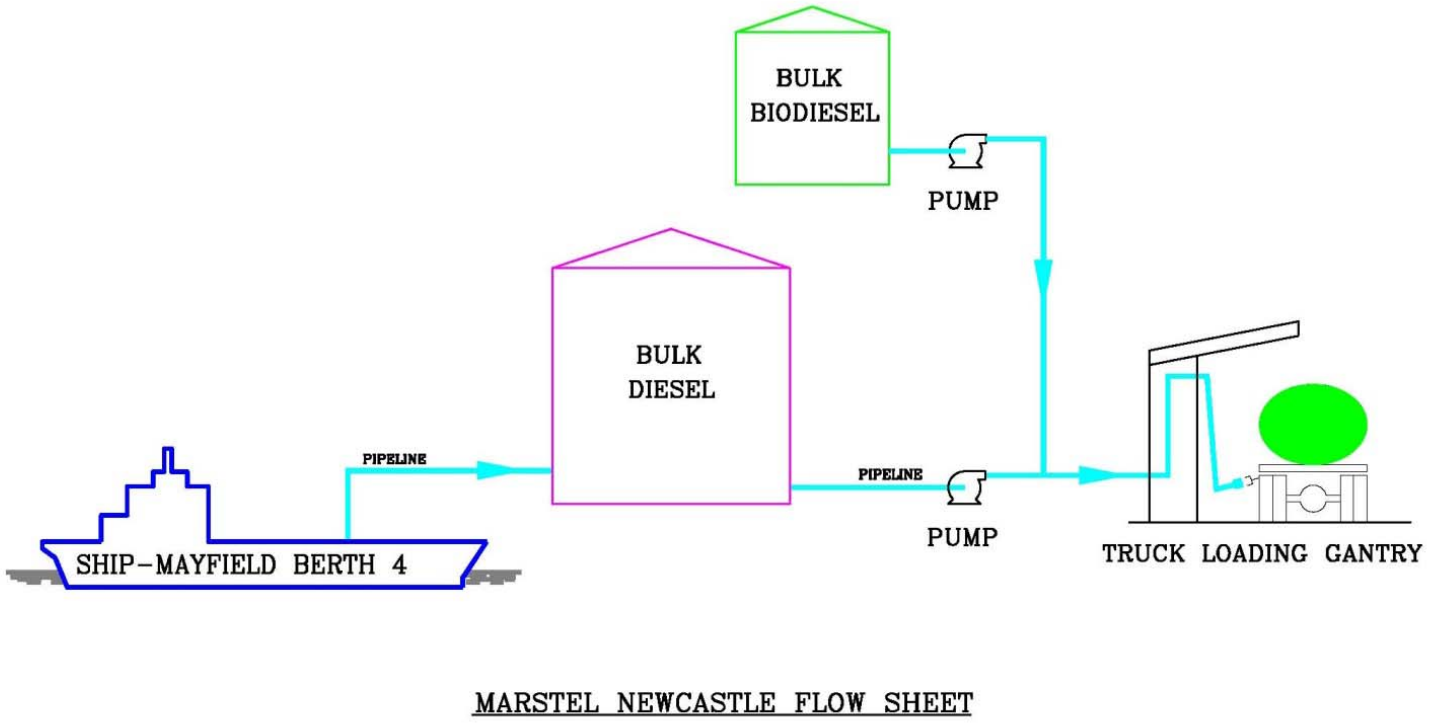


Plate 1 Marstel Newcastle Flow Sheet

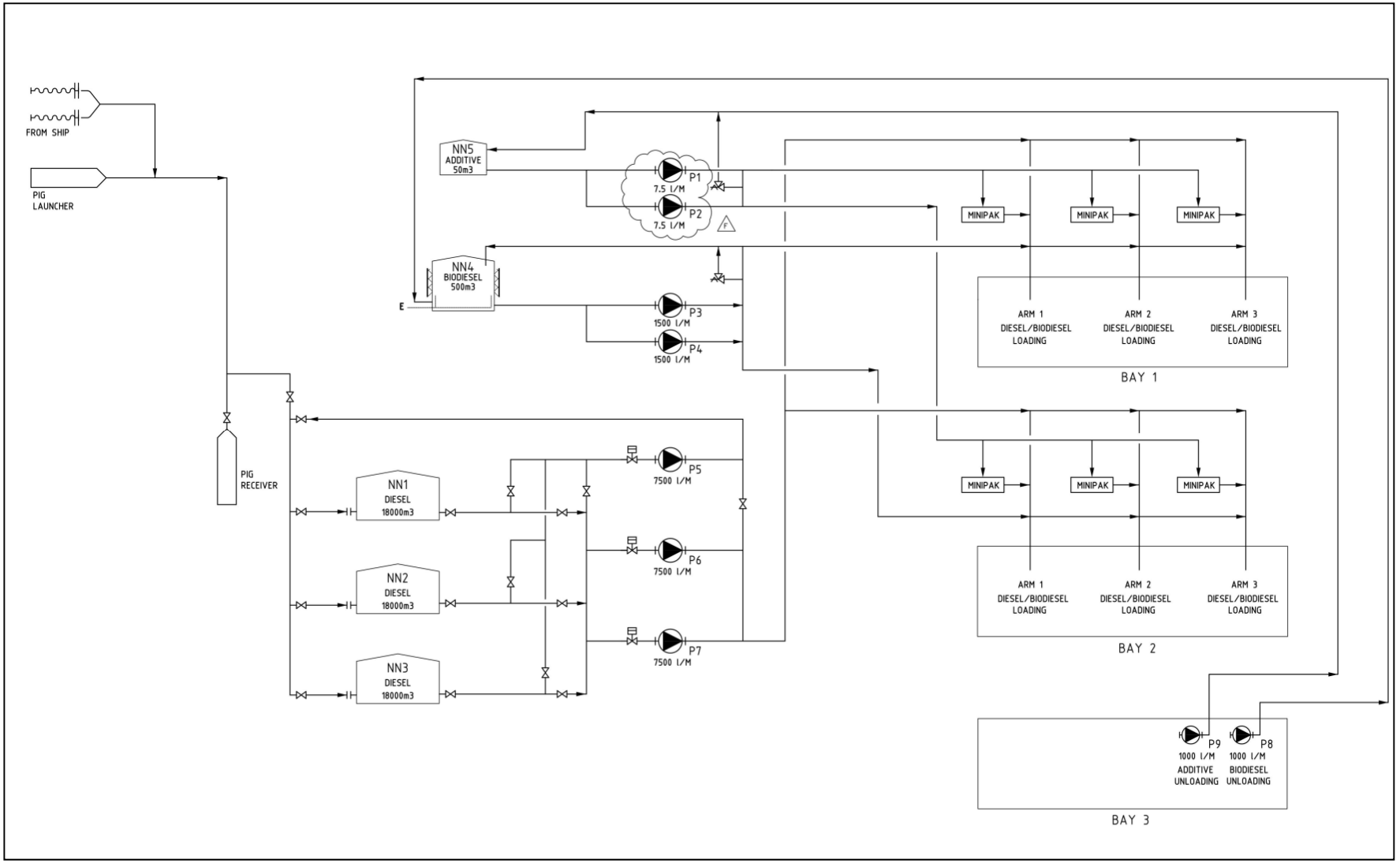


Plate 2 Terminal Flow Schematic

3.6 Proposed Construction Activities

3.6.1 Program of Works

The target start date for the terminal facility is early 2012 (subject to approval) and the target completion date is Q1 2013, with the anticipated construction period of approximately 14 months. The work will be executed by a number of specialist and experienced contractors managed as a project by a dedicated Marstel construction management team led by a site based Construction Manager. A Project Execution Plan is being developed which will encompass a Construction Management Plan, Health and Safety Management Plan, Environmental Management Plan and Quality Management Plan. A Commissioning Plan will be developed during the Construction phase in anticipation of finalising construction and commissioning the facility.

It is anticipated that NPC would provide access to the Site via Selwyn Street during the construction phase of the Facility. This access would run from Selwyn Street, across the Mayfield concept approval site to Mayfield Berth 4, and along the Koppers pipeline easement to the proposed Facility (refer Figure 4).This method of access is proposed for the construction phase, however it may also be used during the early operational stage of the Facility, if the proposed operational access route demonstrated in Figure 5 is not completed.

As outlined in Section 23.1, it is determined that the construction and operation of the proposed Facility in conjunction with other construction and operational activities in the nearby area would not cause significant cumulative impacts.

3.6.2 Outline of Construction Activities

A proposed timeline for the construction activities required for the Project (subject to approvals) is outlined in Appendix B, and has been summarised in Table 3. Specific construction activities required for the Project would include the following:

- Taking possession of the site to establish the surveyed boundaries as per the lease in preparation for site works.
- Establishment of the temporary site construction facilities which would include relocatable site offices, ablutions and shipping containers for temporary site storage purposes.
- Temporary fencing would be required on the site boundaries for security purposes until such time as the major earthworks and civil works are complete. The permanent security fencing can be established some time after those activities.
- Earthworks including the removal of the 550 mm “impermeable” capping over the works area, placed as part of the Contaminated Site Management Plan, and excavation to the top of the existing inert “slag layer” covering the area.
- The compound areas would be lined with Bentomat GCL (Geosynthetic Clay Liner) and crushed rock. Bentomat is a commercially available bentonite product which is used in applications where an impermeable barrier is required (such as in lagoons or waste containment facilities). The bentonite is encapsulated between two layers of geofabric material. Bentomat is supplied in sheets, which can be rolled across the Site. It is important that the material is installed correctly to maintain the integrity of the liner. Rolls of Bentomat would be delivered to the Site in their original packaging to ensure integrity. The rolls would be provided with an overlapping edge, so they may be joined to the next roll. The length of overlap depends on the thickness of liner used. The Bentomat would then be sealed against the sides of the adjacent bund wall footing, which would seal the bund.
- Once the claymix has been installed the area it would be covered by 200 mm crushed rock to create a barrier above the soil and surface and aid the collection of incident rainfall.
- The main tank foundations will be constructed as “Mound” type consisting of engineered fill material. Reinforced concrete compound walls will be constructed in two phases comprising horizontal foundations and later the vertical walls to suit the logistics of other construction activities.
- An extensive stormwater management system will be constructed to manage stormwater and potential spill incidents consisting of bunding, site grading, culverts, collection pits, separation and treatment facilities.

- A series of equipment and structure support foundations will be constructed for the pumps, pipe supports miscellaneous tanks, access ways, pump enclosure structures, truck loadout structure, fire protection equipment etc.
- The three 18,000m^3 Bulk Storage Tanks will be sourced from Hydro Tasmania's Bell Bay Power Station and be relocated by ocean going barge to the site. It is planned to land the tanks at the Mayfield Berth 4 and transport them through the site currently under remediation to the Marstel leased site. Once on the Mayfield site, the tanks would be modified to meet the specific site requirements and extensively tested to meet current code requirements. Specialist heavy/wide load transport equipment will be used for the land transportation. This transportation will not impact on traffic or access to any existing surrounding land use.
- Internal roadways would consist of the main access and egress route through the truck loadout facility, and an 8 metre wide site perimeter "fire access road" providing fire fighting appliance access to all parts of the facility. These roadways will comprise a mixture of concrete, heavy duty asphalt, and chip sealed compacted crushed rock.
- A series of process pipe and pumping systems will be installed to receive and load out the stored product. An extensive fire protection system will be installed. Much of the material would be prefabricated and installed onsite, particularly fuel facility components, thereby minimising the construction activities required onsite, wherever possible.
- The wharf to terminal delivery pipeline will be installed on an existing easement with existing support structures which is currently used by the Kopper Group to pipe liquid product to their facility to the west of the Marstel site. This work will comprise of some additional minor concrete support structures and the addition of fabricated steel supports attached to the existing main support structures. This pipe will be mainly installed at a level close to the ground (approx 1.2m); however, to enable site activities to continue on the remediation project, sufficient areas of the pipe will be elevated to approximately 6.5m above ground in specific areas.
- A three bay truck loadout gantry will be constructed facing a new road yet to be constructed. This facility will have industry standard truck loading equipment installed in a semi-enclosed steel structure with a clad roof and two external side walls.
- Most plant and vehicle activity will be confined to the greater Mayfield site, however, there will be some materials to export and import during the earthworks phase. There will be the previously mentioned Tank Relocation activity which consists of three deliveries at approximately 4-6 week intervals. During the Civil phase there will be regular deliveries of "ready mix" concrete and reinforcing steel etc. During the Mechanical/Electrical phase there will be regular deliveries of material and equipment. At all stages there will be crane activities consistent with a project of this nature.

Table 3 Proposed timeline for construction activities

Task	Approximate Duration	Approximate Start Date	Approximate End Date
Development Approval	-	-	December 2011
Establishment	51 days	December 2011	March 2012
Earthworks	114 days	January 2012	June 2012
Civil Works	209 days	February 2012	December 2012
	Includes: - Appoint and Mobilise 20 days - Sub Grade Works 113 days - Buildings 80 days - Bund Walls (Civil Stage 3) 125 days - Pavements 90 days	 February 2012 March 2012 June 2012 May 2012 August 2012	 March 2012 August 2012 September 2012 October 2012 December 2012

Task	Approximate Duration	Approximate Start Date	Approximate End Date
Structures	145 days	May 2012	December 2012
	Includes: - Stairs and Platforms 15 days - Structural Steel 31 days - Pipe Supports and Cladding 145 days	 November 2012 June 2012 May 2012	 November 2012 August 2012 December 2012
Tanks	322 days	July 2011	October 2012
	Includes: - Design 41 days - Approvals 42 days - Award and Mobilisation 25 days - Prepare Site and Transport Infrastructure 109 days - Relocate and Refurbish NN1 45 days - Relocate and Refurbish NN2 45 days - Relocate and Refurbish NN3 45 days - Tank Site Erection 70 days	 July 2011 November 2011 January 2012 November 2011 April 2012 June 2012 July 2012 July 2012	 October 2012 December 2011 February 2012 April 2012 June 2012 August 2012 September 2012 October 2012
Electrical Equipment Supply	50 days	February 2012	April 2012
Electrical	275 days		
	Includes: - Award and Mobilisation 70 days - HV Works 19 days - MCC 10 days - Earthing 105 days - Run Power to Plant 165 days - Install Light and Power 86 days - Fire and Security 10 days - Controls 10 days - Heat Tracing 20 days	 February 2012 May 2012 August 2012 July 2012 June 2012 October 2012 February 2013 February 2013 December 2012	 May 2012 June 2012 August 2012 December 2012 February 2013 February 2013 February 2013 February 2013 January 2013

Task	Approximate Duration	Approximate Start Date	Approximate End Date
Mechanical	295 days	January 2012	February 2013
	Includes: - Award, Mobilisation and Procurement 90 days - Site Installation 179 days	January 2012 June 2013	May 2012 February 2013
Commissioning	25 days	February 2013	February 2013
Substantially Complete	-	-	29 February 2013

3.6.3 Proposed Modifications to the Existing Remediation

As part of the construction works, Marstel would need to modify and remove some remediated areas around the Site to allow for structural foundations and site levels. However, Marstel would take measures to ensure that the conditions in the CSMP are abided by, as follows:

- The existing clay capping has a low California Bearing Ratio (CBR) and is therefore unsuitable for founding the tanks and structures required for the new terminal.
- It is proposed that the clay capping be removed over the foot print of the entire Site and be disposed of offsite. The clay capping directly to the north and south of the Site perimeter would be drained and regraded by the Newcastle Port Corporation to ensure all surrounding surface water is directed away from the site. This excess clay would be removed offsite for waste disposal according to waste tracking requirements.
- No structures would be founded directly above the subterranean barrier wall.
- Penetration through the subterranean barrier wall surface completion beam would be limited to a trench for the main stormwater pipes which would run from the first flush pit area to the western boundary of the Site. The depth of the trench would not go below 2.0 m AHD to ensure that the integrity of the bentonite wall is not compromised. The area around the completion beam penetration would be reinstated to ensure the capacity of the completion beam is not reduced.
- Where the existing site remediation items are modified or removed to allow construction, the new construction surfaces and stormwater management systems would ensure the permeability of water to the underlying soils is minimised and avoided where practicable.
- The Materials Management Plan (MMP) adapted from the CSMP should be implemented whenever materials beneath the cap are penetrated. This MMP details the requirements for classifying, transporting and reusing materials as follows:
    - Classification into Levels 1, 2 and 3 is based on visual, olfactory and analytical characteristics.
    - A materials tracking system would need to be implemented.
    - The MMP discusses the process of reuse under the proposed cap, in-situ retention, isolation or containment, short-term stockpiling or treatment.
    - A Geotechnical Expert would be required to review and certify future remediation works.
- Materials used onsite should be Virgin Excavated Natural Materials (VENM) of otherwise suitable according to waste guidelines. A record would be kept of materials used onsite, noting their sources.
- Details would need to be maintained for excess materials disposed of offsite under the waste tracking requirements of the *Protection of the Environment Operations (Waste) Regulation 2005*.

As outlined in Section 3.0, the proposed Project has been analysed by an EPA-accredited Contaminated Sites Auditor. The Facility was assessed according to the CSMP and VRA No 26025, in relation to the existing capped surfaces. It was determined that the proposed Project appropriately deals with the requirements of these plans. Table 19 outlines further environmental controls that would be implemented during the operation of the Facility to ensure that it complies with the requirements of the CSMP.

3.6.4 Site Management Plan

Marstel has implemented an extensive suite of environmental controls at its other bulk terminal facilities, with similar procedures and equipment to be installed at the proposed Mayfield terminal facility. These controls cover loading and unloading of road tankers, ship transfer operations, stormwater management and fire management as detailed in Sections 3.6.6 to 3.6.12.

Marstel is an environmentally responsible company, and would develop a comprehensive environmental improvement plan in consultation with key stakeholders including the community, neighbouring industry and regulators. Marstel would implement a program of continuous improvement for environmental performance, and would demonstrate management of the process through setting environmental objectives and measuring performance against those targets. Management would ensure that all team members are fully trained for their respective positions, with a full and clear understanding of their environmental responsibilities and the associated regulatory controls for industry.

Under a deed of agreement between Marstel and NPC, NPC would provide legal access for Marstel and its contractors to the Site. This provision of access by NPC would include the construction of intersections, access ways and services to the Site boundary, and would form part of NPC's management of the Bulk Liquid Storage Precinct as part of the broader Mayfield Concept Approval Plan. Marstel has been advised that NPC is currently seeking the required approvals to provide this access. Marstel is reliant on NPC to undertake the necessary construction works to provide site access as part of NPC's overall management of the Bulk Liquid Storage Precinct.

3.6.5 Construction Environmental Management Plan

Prior to construction of the terminal facility a Construction Environmental Management Plan (CEMP) would be developed. This plan would provide strategies to manage the construction activities occurring on the Site. It would include measures to manage the following factors:

- Surface Water
- Soils and groundwater
- Air quality and odour
- Indigenous and Non-Indigenous Heritage
- Flora and fauna
- Noise
- Waste.

3.6.6 Maritime Safety and Traffic

It is proposed that approximately eight ships per year would enter Newcastle Port to unload at Mayfield M4. Bulk fuel would be transferred from the ship to the terminal facility via an aboveground pipeline. Newcastle Port has approximately 3,000 ship movements per year (NPC 2011) which carry a variety of cargoes, the most significant being coal. The predicted increase of 8 movements per year represents an overall increase of approximately 0.27%. The ships would be prescheduled for entry to the port, therefore it is not predicted that the facility would have an undue impact on ship movements.

Bulk liquid tankers would travel from other ports in Australia and overseas and enter the Hunter River directly on arrival at Newcastle Port. Fuel on board the ship is owned by a third party who would commission Marstel to store and distribute the product throughout the Hunter. Discharge delivery planning would obviate the need for these fuel tankers to anchor off the port, avoiding the potential for a ship grounding hazard in heavy seas. Once the tanker approaches the Port it would be met by a Port Pilot, who would assist with the navigation duties whilst entering and traversing the Newcastle Port entry and Hunter River environs. As the tanker approaches the wharf it would be met by tugs that would be used to assist the berthing of the vessel. Key hazard reduction and safety features of this method of harbour entry and berthing are:

- Tanker does not anchor offshore, avoiding the potential for the ship to be driven on the coast by heavy seas.
- Pilot assisted navigation entering and in the harbour, which eliminates the hazard of unfamiliarity with the harbour entry and port navigation requirements.

- Tug assistance in berthing, which reduces the risk of striking the wharf and damaging the tanker hull leading to the potential for release of product.

All bulk fuel tankers would be operated in accordance with the International Safety Guide for Oil Tankers and Terminals (ISGOTT) and AS3846-2005 "*The Handling and Transport of Dangerous Cargoes in Port Areas*". The ISGOTT standard was first developed in 1978 and is now in its 5th Edition. This is the definitive guide to the safe carriage and handling of crude oil and petroleum products on tankers and at terminals. This is a highly comprehensive document which provides significant detail on all safety standards that must be complied with by all tankers and terminals. Issues that are covered include:

- Safety standards.
- Ship design.
- Principles underlying the International Safety Management (ISM) Code and the International Ship and Port Facility Security (ISPS) Code.
- Ship/shore Safety Check List.
- Standard operating procedures.

In addition to this standard and its adoption by the shipping operator, Marstel in consultation with NPC would develop a Port Operations Management Plan. This would include but not necessarily be limited to:

- Navigation (including movement of barges and interaction with commercial shipping.
- Location and lighting of all floating plant and equipment.
- Movements within the Port.
- Details of tie-up facilities for floating plant and equipment.
- Communication (including communication with the Vessel Traffic Information Centre).
- Notification requirements.
- Risk assessment of all activities.

Marstel would also prepare an Emergency Plan for the proposed Facility (to be available onsite), and a Wharf Emergency Plan (Plan and equipment to be held in a waterproof container at the wharf and be available as part of wharf operations), as outlined in Section 7.3. Specifically any hydrocarbon or chemical spills would be reported to NPC on their dedicated 24 hour phone line (either 1800 048 205 or (02) 4985 8222).

3.6.7 Ship Transfer Operation

The wharf transfer lines connection to the flexible unloading hoses would be pressure-tested to ensure their integrity prior to the arrival of each ship and before products are transferred. All ship unloading operations would be undertaken initially under low flow conditions while additional checks are conducted to ensure the unloading operation occurs appropriately. Hourly line walks and regular control room checks and wharf monitoring would also be implemented. A number of safety features would be installed at the liquids unloading area at M4 including:

- Fire monitor, with foam generating facilities, located at a safe operating distance from the unloading operations.
- Isolating valves on the ship and shore pipework (i.e. at the flexible hose connection points).
- Flexible transfer hoses operated and inspected/tested in accordance with the ADG.
- Bunded wharf to contain any spills, to ensure no spill to the Hunter River.

For further safeguards regarding ship transfer operations, refer to Table 10.

3.6.8 Transfer Pipeline

The transfer pipeline design, construction and operations would incorporate a number of safety features, including:

- Fully welded pipeline.
- Full pressure test of the line on completion of construction.

- Installation of the pipeline under an existing gantry to prevent potential external impacts.
- Pressure testing prior and after connection by hose to the ship before the transfer operation commences.
- Line “pigging” after each transfer operation to ensure no diesel is in line when not in use.
- Annual hydrostatic testing of the transfer line from the wharf to the terminal.

3.6.9 Storage Tanks

The storage tanks would be designed to AP1650 and operated in accordance with the requirements of *AS 1940 The storage and handling of flammable and combustible liquids*. In complying with these standards, the following safety features would be installed:

- Tank level instruments (high and low) with independent high/low alarms.
- Tank vents with anti-flash gauze to prevent potential for sparking and ignition from external sources.
- Multi level temperature measurements.
- Water draining facilities to prevent water build up in the tank and potential corrosion in the tank base.

3.6.10 Road Tanker Loading / Unloading

The loading bays and gantries would be fitted with the following safety systems:

- Bottom loading arms, eliminating the need for flexible hoses.
- Electronic card access by drivers, eliminating unauthorised access to the gantry/loading facilities.
- Overfill protection for the tankers and static connections to prevent the potential for electrostatic build up and spark/ignition source.
- A dead-man button requiring regular activation by the vehicle driver, integrated into the gantry emergency shutdown system.
- Automatic/remote isolation valves at the loading arm feed point to provide loading emergency shut down in the event of incident at the gantry/loading bay.
- Fixed automatic foam deluge system installed throughout the gantry area activated by fusible links in the gantry detection lines.

All loading and unloading activities would be undertaken by the inducted and trained Road Tanker drivers. Operations would be aborted if the dead-man button is not pushed every three minutes. Contractors, drivers and site visitors would undergo inductions in site safety, emergency systems, and environmental risks prior to being allowed onsite. Procedures governing the types of tankers allowed onsite and their proximity to other tankers would also be implemented. Loading and unloading operations would begin and end on low flow settings, with the product pumps starting once a feedback signal is received that indicates all the in-line valves are open. Valves would fully open to the receiving tank once a percentage volume of liquid has been transferred. For further safeguards regarding road tanker loading and unloading, refer to Sections 3.4.2 and 3.4.4.

3.6.11 Stormwater Management

The majority of the Site would be sealed and Marstel would seek to discharge clean stormwater to the Hunter River via an existing box culvert stormwater drain. In order to prevent pollution of river waters from stormwater from the Site, Marstel intends to implement a stormwater management system as per the requirements set out in Patterson Britton & Partners (2007) *Preliminary Design Stormwater Strategy*. Key aspects of the stormwater management system would include:

- A first flush system pit to capture oil and grease from the road tankers on the paved roadways.
- Remote retention pits to collect water from the road tankers fill areas, pump bays and inlet manifold area.
- Testing of water quality prior to release to the Australian Petroleum Institute (API) separator pit then pumped to river discharge.
- Prevention of spills.
- Water quality monitoring.
- System maintenance.

- Treatment of water drained from diesel tanks and the first flush and tanker fill stand remote retention pits that would be pumped to the API separator for final testing before release to the Hunter River.
- Contingency plans for the management of contaminated stormwater.
- Staff training.

Proposed water quality testing measures include:

- Visual inspections of stormwater within the bunded areas for grease, foam, visible oil, and litter.
- In-field testing of bund water quality prior to its release to API separator pit.
- Laboratory analysis of samples from the API separator pit.
- Comparison of the results against water quality criteria prior to release of the water.

Site stormwater from the bunded areas and roads would be segregated. Bund stormwater would be retained in the bund until tested and released via the API separator, where it would be further tested before release to the Hunter River via a valved outlet pit. Roadways trafficked by tankers to be loaded / unloaded would be contoured such that stormwater from the paved roadway is captured in a first flush system that would capture stormwater for the first 15 mm of a rain event, and thereafter divert to the access road stormwater system and, subsequently, to the Hunter River. The captured first flush water would then be treated / separated onsite with any waste oils / solids sent offsite for licensed disposal. The remaining water would be retested and, subject to meeting the water quality criteria, discharged to the river via the Coalescing Plate Interceptors (CPI) and API separators.

The same procedures would apply to water in the bunds that fail to meet the applicable water quality criteria.

3.6.12 Fire Management

The terminal facilities would be designed to minimise safety risks and hazards associated with operations, and would also be fitted with extensive fixed and portable fire-fighting capability. Water would be stored on the Terminal Site in a tank for fire-fighting purposes sourced from Hunter Water. Two diesel-driven fire pumps and a water ring main would provide firewater to tanks and road gantry deluge systems, fixed monitors, fire hose reel sets and fire hydrant connections. The truckfill stand would have fixed automatic foam deluge protection activated by fusible links in the detection lines. The scope of the fire system would be determined by a fire safety study approved by the NSW Fire Brigade. In addition, the following fire safety systems and services would be provided for the proposed facility:

- Fire water pumps in accordance with the requirements of *AS2419 Fire Hydrant Installations* and *NFPA20 Standard for the Installation of Stationary Pumps for Fire Protection*.
- Fire water tank to provide a minimum of 90 minutes fire water onsite (exact storage capacity of tanks to be determined by Fire Safety Study in accordance with the requirements of *AS 1940-2004 Storage and handling of flammable and combustible liquids)*.
- Fire ring main, with hydrants, at selected locations around the Facility.
- An access fire road around the bund to provide fire tender access as required.
- Hose reels and fire extinguishers located throughout the facility according to *AS2419* and *NFPA20*.
- Fire protection facilities at the loading gantries.
- A Fire Safety Study would be undertaken to review the retention of contaminated fire water (refer Section 7.3 for more details).

3.6.13 Security

Marstel is aware of the security needs of such sites, and would implement a comprehensive security system to manage such risks. The Site would be secured by a comprehensive security system that involves a number of components or layers to provide the highest level of security practicable for the facility.

The Site would be bounded by a chain wire mesh fence with a razor wire top. Access to the Site would be via two automatic traffic gates that would be opened by terminal staff or access cards (issued to inducted contractors). Emergency egress points would be located at manually-opened gates and the main traffic gates. The Site would have low-level, inward-directed floodlighting at night in addition to operational task lighting. Tank outlet valves would be ‘locked down’ when not in use.

Principles of Crime Prevention Through Environmental Design (CPTED) have been incorporated into the security system as follows:

- **Natural Access**: Both site entrances would be secured with automatic gates. Access would not involve any dead ends, with employee car parks within easy access of the office and workshop. Employee access would also be separated from delivery entrances.
- **Natural Surveillance**: The entrance to the Site would be well lit and clearly visible from the Site access road. Parking areas would be located at the front of the Site and clearly visible to passing security personnel and the public.
- **Territorial Reinforcement**: Vehicle entrances for trucks and passenger vehicles would be well defined and separated.
- **Target Hardening**: Operational hours would be complementary to the proposed surrounding industries, many of which would operate 24 hours. Sliding security gates would operate at both entrance and exit of the fuel unloading bays.

3.6.14 Contaminated Site Management Plan: Intertrade Industrial Park

The *Contaminated Site Management Plan: Intertrade Industrial Park, Closure Area of Former Steelworks Site Mayfield* (HDC, 2009) (CSMP) provides a common framework to be applied across the whole Intertrade Industrial Area for design, implementation, completion, use and maintenance of works. It applies to Lot 33 DP 1116571, and thus to the proposed Site. The CSMP must be complied with at all times by those carrying on works at the site, including owners, lessees, licensees, contractors, subtenants and occupiers of the site. Marstel would therefore undertake to abide by the conditions of the CSMP.

The CSMP provides requirements in relation to both remediation activities and construction activities occurring at the site. As part of the construction works, Marstel would need to modify and remove some remediated areas around the Site to allow for structural foundations and site levels. However, Marstel would take measures to ensure that the conditions in the CSMP are abided by, as outlined in Section 3.6.3.

The CSMP also requires that, prior to the commencement of infrastructure works on the remediation site a Site Auditor must ensure that the proposed design, estimated outcomes and associated plans are appropriate. An EPA accredited Contaminated Sites Auditor assessed the Proposed Project according to the CSMP and VRA No 26025, and in relation to the existing capped surfaces. The report *Works on Remediated Land Mayfield Diesel Terminal – Newcastle Marstel Terminals Newcastle Pty Ltd* (Aurecon, 2011) was also prepared. Through these assessments it was concluded that the Proposed Project appears to abide by the CSMP and VRA in relation to capping requirements.

For more detail on how the operation phase of the Facility would be in accordance with the CSMP, refer to Table 19.

3.7 Consistency with Concept Plan

Newcastle Port Corporation has prepared a Concept Plan (09_0096) for the development of port-related activities within the former BHP Steelworks site at Mayfield and is currently seeking approval for the Concept Plan pursuant to Part 3A of the EP&A Act. The former BHP Steelworks site (known as the Closure Area or Concept Plan area) is made up of a 60-hectare area at the rear of the site which is to be developed as the Intertrade Industrial Park, and a 90-hectare portside portion being the site of the proposed Concept Plan within which the Marstel proposal sits.

The proposed Concept Plan identifies the following five key land-based operational precincts which would be developed and operated through 2034 (AECOM, 2010). The precincts are:

- NPC Operations Precinct including office, storage sheds, vehicle and marine equipment, Newcastle Port Corporation dredging vessel, pilot cutters and helipad.
- Bulk and General Precinct capable of handling non hazardous dry bulk products including grain, briquettes, and coke cargoes.
- General Purpose Precinct to handle and store cargo containers, heavy machinery, Roll On Roll Off and break bulk cargo. This includes the existing general cargo facility known as Mayfield No.4 Berth.
- Container Terminal Precinct with a trade volume of 1 million twenty foot equivalent units (TEU) per annum at final development.

- Bulk Liquid Precinct used for storage, blending and distribution of high quality fuels and biofuels.

The Concept Plan was developed to provide flexibility for the future development of five key land-based operational precincts and one berth precinct. The Concept Plan would then allow for the detailed planning of land uses within these precincts in the form of Project Approvals. The Marstel Project represents the first such Project Approval sought for the Concept Plan area. In relation to the Bulk Liquid Precinct, the Concept Plan describes it as follows:

The Bulk Liquid Precinct would be used for receival, storage, blending and distribution of fuels. The Bulk Liquid Precinct would be located in the far north western portion of the site, immediately to the north west of the Container Terminal Precinct and fronting Berth 7. Buildings and structures including tank farms with steel storage tanks, fuel distribution pipelines and administration buildings would be provide (AECOM, 2010).

In seeking a location for Bulk Fuels Facility Marstel identified the compatible portside land included in the Mayfield Concept Plan area and specifically the Bulk Liquid Precinct, designed for the storage, handling and distribution of liquids as proposed in the current Marstel Project Application.

The Bulk Liquid Fuels facility as described in this EA falls within the identified Bulk Liquid Fuels Precinct as proposed in the Concept Plan and is a land use of the type and scale intended by the Concept Plan. In addition, the Bulk Fuels Facility has been designed to utilise access, infrastructure and ship berthing as described in the Concept Plan. Importantly the Bulk Fuels facility has been designed to be compatible with the remediation works, specifically the barrier wall, which have been undertaken across the Concept Plan area. Refer to Section 11.0 for further details.

This EA described the proposal as being consistent with the proposed future land uses that are predicted to also utilise the wider Concept Plan area, and will have impacts, both separately and cumulatively, which can be suitably managed as described in the relevant sections of this EA.

Furthermore, Section 22.0 and Table 48 provide a summary of the Statement of Commitments which were included in the *Mayfield Site Port-Related Activities Concept Plan – Environmental Assessment* (AECOM, 2010) for the Mayfield Concept Approval, and demonstrate how the proposed project is consistent with the objectives and criteria set out in that submission.

4.0 Statutory Planning

4.1 Local Matters

4.1.1 Newcastle Local Environmental Plan

The Site is located within the Newcastle City LGA where the relevant local Environmental Planning Instrument (EPI) is the Newcastle Local Environmental Plan (LEP 2003). However, clause 16 of LEP 2003 identifies the proposed Site as lying within the boundary of Three Ports Site (*State Environmental Planning Policy (Major Projects) Amendment (Three Ports) 2005*), and thus falling under the provisions of the *State Environmental Planning Policy (Major Development) 2005* (Major Development SEPP). By virtue of Part 20(4) of Schedule 3 Major Development SEPP, environmental planning instruments other that State Environmental Planning Policies does not apply to the Site as it is located within Three Ports land. The provisions of the LEP 2003 do not apply to the proposed Site.

4.1.2 Newcastle Development Control Plan 2005

The planning controls within the *Newcastle Development Control Plan 2005* (DCP 2005) as they relate to the proposed development include:

- **Element 4.1 Car Parking** – a standard of one car parking space per two employees or one space per 100 m^2 of Gross Floor Area (whichever is greater) is prescribed for all industrial development. The proposal would provide eight parking spaces. There would be a total Office/Workshop floor area of 56 m^2 (excluding tank storage) and there would usually be two operators onsite, except at times when ship unloading events occur and maintenance is required. The parking provision would therefore be compliant with the development control.
- **Element 4.2 Contaminated Land Management** – to reduce risk associated with the potential for, or existing, contaminated land. The Site has undergone Stage 1 of remediation works as part of the Remediation Action Plan (RAP) prepared by SKM in 2004. Stage 2 of the remediation works are currently underway and will be finalised in 2010. The Site is being managed in accordance with the Contaminated Site Management Plan (CSMP) (HDC, 2009), which is required to be enforced by all landowners, agents and occupiers. Marstel would likewise manage the proposal in accordance with the CSMP (refer Section 3.5.3). Table 19 of this Environmental Assessment outlines a list issues to consider in relation to the CSMP.
- **Element 4.3 Flood Management** – a number of studies have been undertaken as part of the site remediation that have investigated flooding and stormwater management on the Site. A stormwater management strategy prepared by Patterson Britton & Partners (2007) indicated that the western drain (located west of the Terminal Site) would not be breached in a 1:100 ARI flooding event. This drain would remain *insitu* post remediation. Therefore it is reasonable to conclude (in relation to the predictions of the Patterson Britton & Partners report) that the Terminal Site would not be subject to flooding.
- **Element 4.4 Landscaping** - to incorporate landscaping as a critical element to a development proposal. The controls indicate that particular development activities, visually prominent sites and development adjacent to open space require landscape planning. The proposal would not be visually prominent or adjacent to an open space reserve (Appendix B). Landscaping of the car parking area and office buildings is proposed and would be developed as part of the site management plan. Boundary vegetation planting would not be included as this would present a fire safety hazard risk. Any remnant weeds that are present post site remediation would be removed and managed. The development proposal would be compliant with the control.
- **Element 4.5 Water Management** - provides controls on drainage and stormwater management and aims to reduce pollutants from entering waterways and encourage the efficient use of water. The proposal includes a Stormwater Management Plan as per Patterson Britton & Partners (2007) to ensure compliance with the development control.
- **Element 4.6 Waste Management** – provides controls to ensure minimisation and management of waste. The proposed development is unlikely to generate significant waste and would operate in accordance with the principles of the *Waste Avoidance and Resource Recovery Act 2001.* The proposal would be compliant with the control.

- **Element 7.1 Industrial Development** – provides controls to ensure compatibility of industrial development with other industrial activities and the suitability of the Site for industrial land-use. The proposal would be compatible with the industrial nature of the locality and with the controls.

Again, by virtue of Part 20(4) of Schedule 3 Major Development SEPP, the provisions of the DCP 2005 do not apply to the proposed Site. Whilst assessment of the proposal against the DCP is not required, the proposal would nevertheless be designed and operated in accordance with the provisions of the DCP, where applicable and appropriate, to demonstrate compliance with local planning requirements, and consistency with local developments.

4.2 Regional Matters

4.2.1 Lower Hunter Regional Strategy

The NSW Government has produced a *Lower Hunter Regional Strategy* (LHRS) which applies to the local government areas of Newcastle, Lake Macquarie, Port Stephens, Maitland and Cessnock.

The primary purpose of the regional strategy is to ensure that adequate land is available in appropriate locations to sustainably accommodate the projected population growth and associated housing, employment and environmental needs over the next 25 years.

The key features of the Lower Hunter Regional Strategy include:

- *Provides for 115,000 new homes to cater for a projected population growth of 160,000 people.*
- *Plans for up to 66,000 new jobs and ensures an adequate supply of employment land.*
- *Promotes growth in centres — a greater choice of housing and jobs in Newcastle's CBD and specified major centres.*
- *Creates important green corridors of land with high environmental value, which will be managed for conservation purposes. These corridors align with existing public reserves, some of which will be expanded.*
- *Protects high quality agricultural land, and natural resources such as water aquifers and extractive materials.*

The Lower Hunter is the sixth largest urban area in Australia and one of the State's major centres for economic activity indicating high demand for fuels. Similarly, strong mining and agricultural sectors in the upper Hunter Region indicate increasing demand for transport and associated fuel consumption. It is anticipated that the Proposed Project would secure the availability of renewable and cost effective fuel for the region as well as providing economic and employment benefits consistent with the objectives of the Lower Hunter Regional Strategy.

4.3 State Matters

4.3.1 Environmental Planning and Assessment Act 1979 (EP&A Act)

The EP&A Act and the EP&A Regulation provide the framework for environmental planning in NSW and include provisions to ensure that proposals which have the potential to impact the environment are subject to detailed assessment, and provide opportunity for public involvement.

As outlined in Section 4.1 the Facility is to be located on land in which Schedule 3 of the *State Environmental Planning Policy: Major Development* (the "Three Ports Site") applies. Developments located within this area require development consent for all works within the Port.

The Project was declared by the Minister to be a project to which Part 3A of the EP&A Act applied before 1 October 2011. The Project will therefore continue to be assessed under the former Part 3A provisions of the EP&A Act, under transitional provisions.

4.3.2 State Environmental Planning Policies

State Environmental Planning Policy (Major Development) 2005

The *State Environmental Planning Policy (Major Development) 2005* (Major Development SEPP) was used to identify developments that were considered to be Major Developments under the EP&A Act before the EP&A Act was amended to remove this definition. However, this Project continues to be assessed and determined under these former Part 3A definitions as it was already declared and revised DGR's were issued before

1 October 2011. The proposed development thus retains its characterisation under Cl 10 of the former Schedule 1 Major Development SEPP as a bulk liquids storage facility with a capital investment of more than $20 million (the Proposed Project has a capital investment of $30 million).

On 29 May 2008, the Minister notified Marstel that the Proposed Project had been declared as a Part 3A Major Project (Project Application 08_0130). At that stage, the scope of operations that was proposed to take place at the Facility was different to that which is currently proposed. Originally, it was proposed that the Facility would receive, store, blend and distribute fuels and biofuels, including petrol, ethanol, diesel and biodiesel. The current proposed Facility would recover, store and distribute diesel and biodiesel only. Marstel is seeking Project Approval for this updated scope of proposed operations at the same location, on the basis of the original declaration from the Minister that the project has been declared as Major Project under Major Development SEPP. The Proposed Project is therefore still considered as Project Application number 08_0130.

By virtue of the Site lying within the SP1 Special Activities zone of the Newcastle Port Site Land Zoning Map under the Major Development SEPP, Schedule 3 of Major Development SEPP also applies to the Proposed Project. Part 20 (4) to Schedule 3 nullifies the effect of all Environmental Planning Instruments on Three Ports land, apart from SEPPs. This has the result that the LEP 2003 does not apply to the Proposed Project.

Under Clause 11(3) the Project is permitted with consent as it can be classified as port facilities (being development for the unloading of freight into or from vessels and associated receival, land transport and storage facilities). Under Part 20 (11) of Schedule 3, the objectives of Zone SP1 Special Activities are as follows:

a) To provide for special land uses that are not provided for in other zones;

b) To provide for sites with special natural characteristics that are not provided for in other zones;

c) To facilitate development that is in keeping with the special characteristics of the site or its existing or intended special use, and that minimises any adverse impacts on surrounding land;

d) To maximise the use of waterfront areas to accommodate port facilities and industrial, maritime industrial and bulk storage premises that benefit from being located close to port facilities;

e) To enable the efficient movement and operation of commercial shipping, and to provide for the efficient handling and distribution of freight from port areas through the provision of transport infrastructure;

f) To facilitate the development that by its nature or scale requires separation from residential areas and other sensitive land uses; and

g) To encourage employment opportunities.

The Proposed Project would be in keeping with the special characteristics of the Site and both its historical past use and current adjacent use as an industrial area. Use of the proposed location would assist in minimising adverse impacts on surrounding land, as the Site is already highly modified. The efficient use of port facilities and existing transport infrastructure are also factors making this Site suitable for the Proposed Project. Separation from residential areas is also desirable for this Project, which would lie 900 m from the nearest residential receiver, on the other side of Industrial Drive, Mayfield.

State Environmental Planning Policy (Infrastructure) 2007 (Infrastructure SEPP)

The aim of this Policy is to facilitate the effective delivery of infrastructure across the State by:

a) Improving regulatory certainty and efficiency through a consistent planning regime for infrastructure and the provision of services;

b) Providing greater flexibility in the location of infrastructure and service facilities;

c) Allowing for the efficient development, redevelopment or disposal of surplus government owned land;

d) Identifying the environmental assessment category into which different types of infrastructure and services development fall (including identifying certain development of minimal environmental impact as exempt development);

e) Identifying matters to be considered in the assessment of development adjacent to particular types of infrastructure development; and

f) Providing for consultation with relevant public authorities about certain development during the assessment process or prior to development commencing.

The proposed development by Marstel Terminals would be consistent with the aims of this SEPP, by utilising current vacant land for a beneficial use.

Schedule 3 lists development which requires referral to the Roads and Traffic Authority (RTA) including:

Transport terminals, bulk stores, container depots or liquid fuel depots with a capacity of 8,000m^2 with site access to any road.

Under section 104 Infrastructure SEPP, the Minister is required to forward the Development Application (DA) to the RTA for comment before making a determination.

State Environmental Planning Policy 33 – Hazardous and Offensive Development (SEPP 33)

SEPP 33 was designed to ensure that sufficient information is provided to consent authorities to determine whether a development is hazardous or offensive. Conditions can then be imposed on the development to reduce or minimise adverse impacts. Any development application for a potentially hazardous development must be supported by a Preliminary Hazard Analysis (PHA).

The document *Applying SEPP 33 – Hazardous and Offensive Development Application Guidelines* was prepared by the Department of Urban Affairs and Planning in 1994 to provide assistance in implementing SEPP 33. The Guidelines recommend a 'risk screening' method for determining whether a proposal is hazardous, and provide guidance on assessing potentially offensive development proposals. This is considered further in Section 7.0.

State Environmental Planning Policy 55 – Remediation of Land (SEPP 55)

SEPP 55 promotes the remediation of contaminated land to reduce the risk of harm to human health or other environmental systems. Clause 7 of SEPP 55 requires a consent authority to consider whether the land is contaminated and whether it is suitable (or can be made suitable) for the proposed development. A CSMP has been developed for the entire former BHP Steelworks Site, which forms part of the Voluntary Remediation Agreement formed under the *Contaminated Land Management Act 1994* (refer Section 2.2). Stage 1 of the remediation has been completed, including the construction of a groundwater barrier around the contaminated parts of the Site and remediation of the surface areas with the application of crushed rock. Stage 2 of the remediation is currently underway and is planned to be completed in 2012 in line with development (HDC, 2010). Construction of the Terminal Site would not interfere with any of the remediation works undertaken onsite.

State Environmental Planning Policy 71 – Coastal Protection (SEPP 71)

The proposed development would be located within the coastal zone as defined by SEPP 71 which makes provisions regarding protection of coastal attributes, protection of natural and cultural heritage elements, coastal environmental protection, and the retention of foreshore public access. Clause 8 of the SEPP provides matters for consideration to be taken into account by a consent authority when determining an application to carry out development. They include:

a) The aims of this Policy as set out in clause 2;

b) Existing public access to and along the coastal foreshore for pedestrians or persons with a disability should be retained and, where possible, public access to and along the coastal foreshore for pedestrians or persons with a disability should be improved;

c) Opportunities to provide new public access to and along the coastal foreshore for pedestrians or persons with a disability;

d) The suitability of development given its type, location and design and its relationship with the surrounding area;

e) Any detrimental impact that development may have on the amenity of the coastal foreshore, including any significant overshadowing of the coastal foreshore and any significant loss of views from a public place to the coastal foreshore;

f) The scenic qualities of the New South Wales coast, and means to protect and improve these qualities;

g) Measures to conserve animals (within the meaning of the Threatened Species Conservation Act 1995) and plants (within the meaning of that Act), and their habitats;

h) Measures to conserve fish (within the meaning of Part 7A of the Fisheries Management Act 1994) and marine vegetation (within the meaning of that Part), and their habitats;

i) Existing wildlife corridors and the impact of development on these corridors;

j) The likely impact of coastal processes and coastal hazards on development and any likely impacts of development on coastal processes and coastal hazards;

k) Measures to reduce the potential for conflict between land-based and water-based coastal activities;

l) Measures to protect the cultural places, values, customs, beliefs and traditional knowledge of Aboriginals;

m) Likely impacts of development on the water quality of coastal water bodies;

n) The conservation and preservation of items of heritage, archaeological or historical significance;

o) Only in cases in which a Council prepares a draft local environmental plan that applies to land to which this Policy applies, the means to encourage compact towns and cities; and

p) Only in cases in which a development application in relation to proposed development is determined:

(i) The cumulative impacts of the proposed development on the environment; and

(ii) Measures to ensure that water and energy usage by the proposed development is efficient.

In response to these matters, it is considered that the proposal is consistent with SEPP 71 as follows:

- Existing public access is not available to the Site and new public access would be detrimental to the security of the Site and pose a hazard risk. Public access along this section of the foreshore would not be a priority given the industrial nature of the area.
- The proposed use is compatible with the industrial nature of the locality.
- There would be no detrimental impact on views to and from the foreshore.
- The scenic qualities of the coast in the proposed location have already been characterised by industrial buildings and port-related activities.
- The Site has been completely cleared and covered with crushed rock as part of remediation activities.
- There are no existing wildlife corridors.
- Existing coastal processes would not be impacted by the proposal, nor is it considered that those processes would impact on the development of the Site.
- The proposal is not expected to impact upon existing water borne activities. The port facilities are intended to be utilised some 8 times per year with lengthy scheduling, so would not impede other shipping or boating activities.
- Water quality effects would be minimised through the implementation of a Water Management Plan.
- No known heritage items would be affected by the proposal.
- The cumulative effects of the development have been considered as part of this EA and the attached PHA, and considered to be minimal.
- Energy and water efficiency measures are proposed for the new facility.

4.3.3 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) prohibits any person from causing pollution of waters or air, and provides penalties for pollution offences relating to water, air and noise.

The POEO Act provides a regulatory framework for the licensing of all activities listed in Schedule 1 to the Act that have the potential to impact on the environment.

The Proposed Project would be likely to require an Environmental Protection Licence (EPL) as a chemical storage facility for petroleum products with a capacity to store more than 200 tonnes of petroleum products under Clause 9, Schedule 1 of the Act. Refer to Section 4.5.

4.3.4 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NP&W Act) governs the establishment, preservation and management of national parks, historic sites and certain other areas, and the protection of certain fauna, native plants and Aboriginal relics.

Section 86 of the NP&W Act identifies offences relating to Aboriginal objects, including disturbing land to discover an artefact. Section 87(1) of the NP&W Act requires a permit to be obtained to remove any artefacts, while section 90(2) of the NP&W Act requires consent from the Director General of OEH to knowingly destroy, deface or damage a relic or Aboriginal place.

The Site has been highly modified, most recently by remediation activities; therefore it is highly unlikely to contain items of Indigenous significance, as outlined further in Section 16.

4.3.5 Heritage Act 1977

The *Heritage Act 1977* aims to protect and conserve non-Aboriginal cultural heritage, including scheduled heritage items, sites and relics. The *Heritage Act* is administered by the Heritage Council of NSW.

The Heritage Act makes provision for a place, building, work, relic, moveable object, precinct, or land to be listed on the State Heritage Register. If an item is the subject of an interim listing, or is listed on the State Heritage Register, a person must obtain approval under section 58 of the Heritage Act for works or activities that may impact on these items.

An investigation of potential archaeological materials located on the NPC's Mayfield site was conducted as part of the CSMP. Heritage resources were identified and these are to be maintained on the Site for the development of an interpretation facility. These were the archaeological site of the Hunter River Smelting Co, the Chief Engineer's Office and the Pattern Store.

As Marstel aims to comply with the conditions of the Mayfield Concept Approval Submission, further approvals required under Part 4 of the Heritage Act would not apply to the Proposed Project. Further, the assessment of the proposed development identified that it is not likely to impact on items requiring protection or conservation identified in the Heritage Act including the interpretation facility as archaeological items have not been located on the proposed Marstel Terminals Site (refer Table 39 for more detail).

4.3.6 Roads Act 1993

The *Roads Act 1993* regulates the carrying out of certain activities on public roads, provides classification of roads and establishes procedures for opening and closing public roads.

Section 138 of the *Roads Act 1993* requires consent to be obtained from the appropriate roads authority for the following works:

a) erect a structure or carry out a work in, on or over a public road, or

b) dig up or disturb the surface of a public road, or

c) remove or interfere with a structure, work or tree on a public road, or

d) pump water into a public road from any land adjoining the road, or

e) connect a road (whether public or private) to a classified road.

The proposed development would connect to a road that would intersect with a classified road. The exact location of this intersection has been identified in Transport Assessment Report provided in Appendix D, which has been undertaken in consultation with NCC, NPC and the RTA.

4.3.7 Water Management Act 2000

. As the proposed Site lies adjacent to the South Arm of the Hunter River, the Site would be classified as waterfront land (being within 40 m of the Hunter River). The Proposed Project would thus be classified as a controlled activity under the WM Act, which ordinarily requires approval under Section 91(2) of the WM Act from the NSW Office of Water (NOW).

However, the Proposed Project would be carried out according to a lease in respect of land under the control of Newcastle Port Corporation. By virtue of Clause 39 of the *Water Management (General) Regulation 2011*, Marstel would therefore be exempt from obtaining such a controlled activity permit. There is a further, general exemption from the requirement to obtain a controlled activity permit as Marstel are seeking Project Approval under Part 3A of the EP&A Act (Section 75U EP&A Act).

Marstel would nevertheless carry out the Proposed Project as per NOW's Controlled Activities Guidelines 2010/2011, in particular the *Controlled Activities: Guidelines for in-stream Works* (NoW, 2010), and the *Controlled Activities: Guidelines for Outlet Structures* (NoW, 2010).

4.3.8 Water Act 1912

The *Water Act 1912* regulates both the use and management of water resources in NSW. The Act is gradually being replaced by the Water *Management Act 2000*.

Ongoing sampling and analysis of groundwater would be routinely undertaken for pH, EC, metals, VOCs, PAHs and groundwater flow rates. This would be undertaken through the construction of four groundwater wells for monitoring purposes. As outlined further in Section 10.3, groundwater at the Site also has the potential to be permeated through construction activities. There is currently no Water Sharing Plan that applies to this groundwater source, and therefore approval under Part 5 of the *Water Act 1912* would be required before these activities take place.

Under Section 113 of the Water Act this application for a Part 5 licence must be made to the Water Administration Ministerial Corporation. If the bore is or will be an artesian bore, of if the circumstances warrant the Corporation shall cause an advertisement in the Gazette and in a local newspaper detailing the Part 5 licence application. These notifications would invite interested persons to comment on the Part 5 licence application.

4.4 Commonwealth Matters

4.4.1 Environment Protection and Biodiversity Conservation Act 1999

In addition to State-based approvals, actions that may significantly affect matters of National Environmental Significance (NES) require assessment and/or approval from the Commonwealth under the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*. The EPBC Act lists eight matters of NES that must be addressed when assessing the environmental impacts of a proposal. These are considered further in Section 16.2. It is anticipated that the Proposed Project would not have a significant impact on any of these matters of NES.

4.5 Approvals Required

The Site has been previously cleared as part of the demolition and remediation works undertaken onsite, and the Proposed Project would utilise portside industrial land for a port related purpose. The permits and approval outlined below are, therefore, expected to be required for the Proposed Project.

4.5.1 Environmental Protection Licence

Schedule 1 of the *Protection of the Environment Operations Act 1997* (POEO Act) outlines activities that require an Environmental Protection Licence (EPL). The Proposed Project would be likely to require an EPL as a chemical storage facility for petroleum products with a capacity to store more than 200 tonnes of petroleum products under Clause 9, Schedule 1 of the Act.

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5.0 Consultation and Identification of Issues

5.1 Formal Procedure for Consultation

This EA has been prepared in accordance with transitional arrangements for the former Part 3A of the EP&A Act and its Regulation. These provisions of the former Part 3A of the EP&A Act ensures that the potential environmental effects of a proposal are properly assessed and considered in the decision making process.

On 29 May 2008, notification was provided to Marstel that the Proposed Project would be considered by the Minister Planning (the Minister) as a Part 3A Major Project (Project Application 08_0130). Requirements that are to be met for the Project Approval are detailed under the provisions of Section 75F of the EP&A Act. These requirements include the preparation of an EA in accordance with the Environmental Assessment Requirements (EARs) of the Director General of DP&I.

An Environmental Assessment Scoping Report (EASR) was prepared by AECOM (formerly ENSR) in May 2008 and submitted to the DP&I in relation to Project Application 08_0130. The EASR identified the significant environmental issues that should be addressed by the assessment process. On 7 July 2011, the Director General issued updated EASRs for the proposed Facility which take into consideration the amended scope of activities that are proposed to take place at the Facility (Appendix A).

In preparing this EA the updated EARs dated 7 July 2011 have been addressed as required by Clause 75F of the EP&A Act. Each of the matters raised by the Director General for consideration in the EA are outlined in Table 4, together with the relevant section of the EA which addresses that matter.

Table 4 Environmental Assessment Requirements (DGRs)

Matter	Section of EA
General Requirements	
The EA must include: - An executive summary; - A detailed written description of the project, including; • The need for the project; • Alternatives considered; • The likely staging of the project; • How the project would interact with other existing and approved port and industrial operations in the vicinity of the site; • Plans of all building works and associated infrastructure. - A clear demonstration that the project is consistent with all environmental assessment requirements set out in the Concept plan for Port Facilities at Mayfield (09_0096) (if approved); - A risk assessment of the potential environmental impacts of the project, identifying the key issues for further assessment; - A detailed assessment of the key issues specified below, and for any other significant issues identified in the risk assessment, which includes: • A description of the existing environment, using sufficient baseline data; • An assessment of the potential impacts of all stages of the project on the environment, including any associated cumulative impacts associated with the operation of the project and any other approved or proposed port or industrial operations in the area; • A description of the measures that would be implemented to avoid, minimise and if necessary offset the potential impacts of the project, including evidence that all relevant prevention and mitigation measures would be applied where reasonable and feasible; and • Contingency plans for managing any significant risks to the environment. - A statement of commitments, outlining all the proposed environmental management and monitoring measures; - A conclusion justifying the project, taking into consideration: • The suitability of the site; • The economic, social and environmental impacts of the project as a whole;	 Section 1.3 Section 3.2 Sections 3.6 and 22.0 Sections 3.1.3, 2.3 and 22.0 Section 3.5 Section 22.0 Section 6.0 Sections 2.0, 16.1, 8.1, 10.1, 11.1, 9.1, 13.1, 12.1, 17.1, 18.1, and 23.0 Sections 7.0 to 18.0 Section 21.0 Section 7.3 Section 21.0 Section 22.0

Matter	Section of EA
and • Whether the project is consistent with the objects of the *Environmental Planning and Assessment Act 1979*. - A signed statement from the author of the EA, certifying that the information contained within the document is neither false nor misleading.	Section 24.6 Quality Page
Hazards and risks	
- An assessment of the potential hazards and risks to adjacent port and industrial operation, people and/or the environment associated with the project; - How ecological and human risks posed by contaminants in the context of past, existing and future land uses would be managed; and - How the project would comply with the approved remediation works and associated management measures across the former BHP Billiton steelworks site.	Section 7.0 Sections 10.3 and 11.3 Sections 2.2 and 4.3.2
Soil and Water	
- An assessment of impacts to remediation works, soil and stability during the construction and operation of the project, including the controls that would be put in place to manage erosion and sediment, stormwater and acid sulfate - An assessment of impacts to groundwater and surface water resources during the construction and operation of the project, including the Hunter River Estuary.	Sections 8.0 and 11.0 Sections 11.0 and 12.0
Transport and Access	
- Accurate predictions of the traffic generated by the project; - A detailed assessment of the potential impacts of the project on the capacity, efficiency and safety of the road and shipping networks; - Details of any upgrades to road or shipping infrastructure that would be required due to the project; and - Site access, internal roads and vehicular parking required as a result of the project	Section 13.0 Figure 9
Noise and Vibration	
- Including a quantitative assessment of construction, operational and transport noise and vibration impacts to surrounding receivers from on site and off site activities (including shipping).	Section 12.0
Air Quality	
- Including a quantitative assessment of the air quality and odour impacts of the project on surrounding receivers.	Section 9.0
Greenhouse Gas	
- Including a quantitative assessment of the potential Scope One, Two and Three greenhouse gas emissions of the project and a qualitative assessment of the potential impacts of these emissions on the environment.	Section 9.4
Waste	
- Including accurate estimates of the quantity and classification of potential liquid and non-liquid waste streams of the project and a description of the measures that would be implemented to ensure that any waste produced is appropriately handled, processed and disposed of.	Section 15.0

5.2 Consultation with Stakeholders and other Relevant Authorities

The Proposed Project is classed as a Major Project and as such environmental assessment requirements from the relevant statutory authorities were requested by DP&I as part of the consultation formal procedures. In parallel with this, during the preparation of the EA, AECOM and Marstel consulted with relevant authorities to further discuss pertinent issues. Table 5 below provides a summary of the assessment requirements and expectations of each relevant authority.

Table 5 Stakeholder Consultation

Agency	Issues	Comment / Reference in EA
Department of Planning and Infrastructure	Those issues raised by DP&I are addressed in the Director General Requirements.	Section 5.1
NSW Office of Environment and Heritage	No comment received at the time of original submission. After submission of the EA to the DP&I for adequacy review, OEH again advised that it had no comments.	NA
Newcastle Port Corporation	No comment received at the time of this submission.	Table 5
Roads and Traffic Authority	No comment received at the time of this submission.	NA
NSW Maritime	No comment received at the time of original submission. After submission for the EA to the DP&I for adequacy review, NSW Maritime advised it is interested in construction activities adjacent to, or on, land under their ownership. NSW Maritime is particularly interested in the pipeline connection points and bunded wharf.	Section 2.4
Newcastle City Council	No comment received at the time of this submission	NA
NSW Office of Water	After submission of this EA to the DP&I for adequacy review, NoW requested the following: - That the EA take into consideration the objects and water management principles under the *Water Management Act 2000*. - That the EA clarify the application of the *Water Management Act 2000* and the *Water Act 1912* in relation to the Proposed Project. - That the EA be clarified in relation to the proposed use of groundwater monitoring bores, and in particular, whether these would be used or not.	Section 4.3 Sections 4.3.8 and 10.3 Sections 4.3.7 and 10.0
Hunter Development Corporation	Consultation was undertaken with HDC who initially indicated that they had no further comment in relation to the proposal other than the feedback they provided to DoP which was then incorporated into the DGRs. Issues raised by HDC which were subsequently included in the DGRs were: - Compliance with existing Contaminated Site Management Plan.	Table 20

Agency	Issues	Comment / Reference in EA
	- Contamination/remediation management.	Sections 2.2, 4.1.2, 4.3.2 and 21.3
	- Environmental Risk Analysis be completed.	Section 6.0
	- Access to services.	Sections 3.2.1, 3.4.1, 3.4.2
	- Traffic movements/frequencies.	Section 3.4.1, 3.4.2, 3.4.4
	- Security and access controls for traffic movements.	Sections 3.4.1, 3.4.2, 3.4.4
	- Emergency response plans for pipeline rupture.	Section 7.3 and Table 10
	After submission of the EA to the DP&I for adequacy review, HDC made the following comments:	
	- HDC is reliant on other land owners and agencies to enforce the CSMP.	Sections 2.2 and 4.1.2
	- Consideration must be given to alternative arrangements until the Lot 1 road proposed to be constructed by Buildev is actually completed. This will not affect Marstel's construction phase, but it will impact on the operational phase of the storage facility.	Section 3.3
	- In relation to other services, some further consideration could also be given in relation to timing and alternative arrangements.	Section 3.5.5
	- The EA doesn't provide a comprehensive response to all of the requirements of the CSMP.	Sections 3.6.3 and Table 19
	- HDC will be carrying out remediation works on Lot 3 including in the vicinity of the Proposed Project and Selwyn Street in 2012. Consideration will need to be given to how Marstel's construction access from Selwyn Street can be accommodated across this remediation area.	Feedback from HDC since the issuing of these comments indicates remaining remediation activities are minor and short term in nature and will not impact construction traffic by the time construction is scheduled to start.
	- The NPC traffic study has been included in the Marstel EA. That study ranks the Buildev development as coming into line in 2024 and last when compared to development on the NPC/Lot 3 lands. HDC expects that the Buildev development will come into line significantly before 2024 and that this assumption may need to be reconsidered.	The 2024 expected traffic includes anticipated annual growth in traffic along Industrial Drive. As expected cumulative traffic can be accommodated in 2024 subject to certain improvements these can also be accommodated earlier if required. Regardless traffic levels and intersection LOS will trigger intersection improvements as required and not by a certain date.
NSW Department of Primary Industries	No comment received at the time of this submission.	NA

5.3 Community Consultation

Marstel is a committed and responsible corporate citizen, and strongly believes that regular communication with residents and neighbouring industries is central to the creation of harmonious relationships. Marstel also supports community involvement in decision-making and forums, processes surrounding the environmental future of the Newcastle Port area as well as the suburb of Mayfield.

Marstel initiated contact with the community during the planning and assessment phase of this Project. The Correct Planning and Consultation for Mayfield Group (CPCMG) held a meeting on the 10 August 2011 where Marstel briefed those in attendance on the proposed project and responded to questions raised. It is understood the group has also extended an invitation to other community groups who may be interested in attending. A summary of the matters raised during that consultation together with the responses is provided in Table 6.

Table 6 Community group consultation – questions and responses

Comments received from community (CPCMG) meeting on 10.8.2011	Responses to community group questions
1. What role will the Shell North Hamilton Depot play in the new proposed Mayfield development? With the closing of the Shell Clyde refinery, will Shell Mayfield be used to supply Shell Hamilton North? Will there be a lot of tankers tracking back and forth between these two Newcastle Shell depots?	The proposed facility is a standalone facility which will have the ability to provide capacity for Shell to service its existing customers. Whilst operations between Shell facilities are a matter for Shell, there is no identifiable need for any tankers to be moving between the proposed facility and any Shell facility. Rather tankers will move from the facilities to customers.
2. On your projected and hoped for timetable, you and I had a telephone discussion a few days ago, but I don't think you covered this in any detail last night. Two page handout (sic, indicated) that: a) you are intending to lodge a draft Environmental Assessment (EA) for adequacy checks by early August. Have you lodged that yet? b) you will be seeking to obtain planning approval in Oct 2011. In our recent telephone conversation you advised, as well as the above, that if all goes well, and you get your DA Approval by Oct 2011, then: • you will start work in Nov 2011; • there will be a 14 month construction period; • that you hope to be operational by early 2013.	a) In order to include the outcomes of the initial community meeting, lodgement of the EA will take place soon after the community meeting. b) Due to statutory timeframes the earliest possible date for approval would be Oct 2011. Whilst works would be started as soon as possible there would be approval conditions that require additional planning prior to the commencement of physical works. Construction is planned to be approximately 14 months. If the approval is issued in a timely manner then commissioning works may begin in early 2013 and operations early-mid 2013.
3. We are interested to know how you see that timetable interacting with: • a Public Exhibition period; • any public briefings & information sessions that you will run as part of that exhibition period;	• The public exhibition period is a statutory period during which the public has the opportunity to review and comment in the Environmental Assessment (EA) and proposed project. • Marstel intends to regularly meet with community groups such as the *Correct Planning and Consultation for Mayfield Group,* to provide updates on the progress of the application and answer questions. Meetings would be planned in

Comments received from community (CPCMG) meeting on 10.8.2011	Responses to community group questions
• Time for submissions; • Assessment of those submissions; • Responses by you to those submissions; • Assessment by the Planning Department of your responses - any follow up responses the Department may require; • Any reporting back to the community of your response to those submissions.	consultation with the group to coincide with their meeting dates where possible. • Submissions will be accepted during the exhibition period. Submissions can be made in hardcopy (letter) form or via the Department of Planning and Infrastructure (DP&I) website. Late submissions are generally accepted within reason (for example to allow for delays in postage). • DP&I will forward all submissions to Marstel for consideration. Marstel will then prepare a response to the DP&I addressing those issues raised in the submissions. If amendments to the project occur in response to submissions, a Preferred Project Report (PPR) will be prepared addressing matters raised and amendments. • The DP&I will review the Response to Submissions or PPR to determine whether the proponent has adequately addressed those issues raised in the submissions. The DP&I may request additional information if they believe any matter has not been adequately addressed. • Application documentation will be available on the DP&I website for review by the public. It is envisaged that the community will also be updated during meetings with community groups.

As part of the community consultation for their previous proposal in the site for a larger scale plant on Kooragang Island, Marstel provided community groups and their representatives with information flyers to provide information to the public about the proposed development. These community groups included:

- Environmental Protection & Pollution Advisory Committee
- Kooragang and Citizens Alliance
- Mayfield Resident Forum
- Mayfield Residents Action Forum
- Carrington Residents Action Group
- Hunter Coastal and Estuary Management Committee
- Kooragang Wetland Rehabilitation Project
- Hunter Bird Observers Club.

Information flyers previously provided information on the construction and operation of the proposal, and potential issues that have been addressed in the assessment and proposed operational procedures to manage these issues. No response was received by these community groups, and therefore no public meetings were conducted. However, it is envisaged that a community meeting will be organised during the exhibition period to provide additional information for comment regarding the proposed development.

6.0 Prioritisation of Issues

6.1 Issue Identification

6.1.1 The Issues

The key issues identified during the preparation of this EA and other consultations as previously discussed in Section 5.0are shown in Table 7.

Table 7 Issues Identified by DP&I and Community Groups

Issue	Aspect
Environment	- Hazards - Surface Water Quality - Air Quality and Odour - Greenhouse Gas - Soils and Stability - Acid Sulfate Soils - Groundwater Quality - Indigenous and Non-Indigenous Heritage - Ecology - Waste
Social	- Hazard and Risk - Noise - Traffic - Visual - Consultation - Demand on Resources - Utilities
Project	- Strategic Planning

6.2 Issue Prioritisation

6.2.1 Approach

The prioritisation of issues for the Proposed Project was based on the need to recognise that a higher degree of assessment is required for the issues with the highest severity and greatest possible consequences. Table 8 shows the issues prioritisation matrix used to identify priorities.

Each issue was given a ranking between one and three for the potential severity of risks and the perceived consequence of those effects if left unmanaged. These two numbers were added together to provide a numerical ranking for the issue that was used to categorise each issue into high, medium and low priorities.

The allocation of risk is based upon the following considerations:

Severity of Risk

Low: localised implications; imperceptible or short term cumulative impacts.

Medium: regional implications; modest or medium term accumulation of impacts.

High: inter-regional implications; serious or long term cumulative impacts.

Consequences of Unmanaged Effects

Low: minor environmental change; offsets readily available.

Medium: moderate adverse environmental change; offsets available.

High: important adverse environmental change, offsets not readily available.

Table 8 Issues Prioritisation Matrix

Severity of Effects	Consequences of Unmanaged Effects		
	3 High	2 Medium	1 Low
1 Low	4 (Medium)	3 (Low)	2 (Low)
2 Medium	5 (High)	4 (Medium)	3 (Low)
3 High	6 (High)	5 (High)	4 (Medium)

6.3 Assessment

The prioritisation of environmental issues related to the Proposed Project is provided in Table 9.

This environmental risk analysis prioritises environmental issues in the absence of appropriate safeguard measures to manage environmental effects. This analysis was then used to inform the environmental assessment and the engineering and environmental design of the Project and in the identification of appropriate safeguards.

Table 9 Prioritisation of Environmental Issues

Issue	Severity	Consequence	Priority
Hazard and Risk	2	2	4 (Medium)
Surface Water Quality	2	2	4 (Medium)
Air Quality and Odour	2	2	4 (Medium)
Groundwater Quality	1	2	3 (Low)
Soils and Stability	1	2	3 (Low)
Noise and Vibration	1	2	3 (Low)
Consultation	1	2	3 (Low)
Transport and Access	1	2	3 (Low)
Visual Impacts	1	1	2 (Low)
Greenhouse Gas Emissions	1	2	3 (Low)
Waste	1	1	2 (Low)
Demand upon community, natural or transport resources	1	1	2 (Low)
Ecology	1	1	2 (Low)
Heritage	1	1	2 (Low)
Socio/Economic	1	1	2 (Low)
Utilities	1	1	2 (Low)
Acid Sulfate Soils	1	1	2 (Low)

6.4 Final Assessment

In summary, therefore, the final prioritisation of issues identified for the Proposed Project is:

Medium

- Hazard and Risk
- Surface Water Quality
- Air Quality and Odour

Other factors and aspects were rated as ‘low.’

7.0 Preliminary Hazard Analysis

7.1 Methodology

A Preliminary Hazard Analysis (PHA) was undertaken to assess the potential risks of the proposed Facility (Appendix E). This was undertaken in accordance with the NSW Department of Planning and Infrastructure *Applying SEPP 33: Hazardous and Offensive Industry Development Application Guidelines* (DP&I 1994). Due to the inert nature of the materials proposed to be stored and handled at the Facility, as well as the nature of the surrounding land uses (industrial, with the nearest residential area located approximately 900 m away) a qualitative form of analysis was undertaken.

7.2 Predicted Impacts

The PHA considered the hazards and risks associated with operations at the proposed Facility. A breakdown of the substances which are to be stored and handled onsite and their potentially hazardous properties are outlined below:

- Approximately 54,000 m^3 of diesel fuel would be stored onsite when the Facility is operating at full capacity. Diesel is a combustible liquid which does not flash or vaporise readily at ambient temperatures. Diesel vapour clouds therefore do not form, catch alight, or explode at ambient temperatures. It would only be localised heating and minor vapour generation which could cause ignition and pool fire at the Facility, and possibly lead to more significant incidents. Diesel is classed as a C1 substance under the ADG.
- The Facility would have the capacity to store approximately 500 m^3 of bio-diesel. Biodiesel is generally comprised of fatty acid esters and tends to behave similarly to diesel in that it will not readily flash at ambient temperatures. Biodiesel is classed under the ADG as C1 or C2, depending on the flashpoint of the particular fatty acid esters it contains.
- The Facility would have capacity to store 50 m^3 of diesel additives. These are not classed under the ADG, and are thus not considered any further in terms of hazard.

The qualitative PHA concluded that the storage and handling of diesel and biodiesel onsite would present a low risk due to the high flash points of these substances (for instance, greater than 90^{o}C). The proposed methods for storage and handling of diesel and biodiesel create a very low risk for ignition or explosion to occur onsite.

Under the guidelines of *Applying SEPP 33,* diesel and biodiesel are not classified as Dangerous Goods subject to SEPP 33 requirements.

Table 10 outlines the operational hazards that would be present at the proposed Facility through the storage and handling of these fuels, and the mitigation measures that would be used to safeguard against these risks.

Table 10 Operational Hazards

Site Area/ Operation	Cause	Consequence	Safeguard
Berth 4	- Ship enters berth at too high a speed.	- Potential for ship to strike the wharf resulting in damage to ship's hull, hull breach and release of diesel fuel to Hunter River.	- Ship is berthed with assistance from Newcastle Ports Pilot (trained in Newcastle berth procedures). - Ships speed is limited during approach to M4 (monitored by Pilot). - Berthing assistance is provided by Newcastle Harbour Tugs (prevent direct approach to wharf by ship). - Berthing facilities and operations follow strict ISGOTT procedures. - Ship's captain is certified master mariner, with extensive ship handling experience. - Wharf is fitted with "Fenders" to prevent direct strike of solid wharf components on the ship.

Site Area/ Operation	Cause	Consequence	Safeguard
Liquid (Fuel) Delivery and transfer using flexible hose (including bulk fuel deliveries at wharf)	- Hose failure. - Connection failure. - Human error (incorrect connection). - Ship moves away from berth (wind, failed lines).	- Potential spill on the ship's deck. - Spill onto the wharfs. - Potential spill off ship's deck or wharf into the harbour (Hunter River) – environmental impact. - Ignition of spill and fire on the wharf and in the contained boom area around the ship.	- Personnel (Ship and Shore) in attendance during full fuel delivery/transfer. - Wharf area where fuel lines are located is bunded to prevent direct spill to the Hunter River. - A spill containment boom would be available to be deployed around the ship and wharf in the event of a spill. - Site/wharf emergency plans would be developed to respond to spills. - Spill kits would be available for minor spills. - Monitor, with foam generation facilities, would be installed adjacent to the fuel transfer point at a safe distance from the flexible lines (to be established by Fire Safety Study). - Additional fire hydrants located close (within 60 m) of the fuel transfer location. - Ship is tied up with two lines at every tie point.
Liquid transfer via pipeline (diesel fuel)	- Pipeline leak due to corrosion, overpressure; poor construction (welding), external interference.	- Leak of liquid to environment. - Ignition of leak and fire at leak point.	- Pipeline would be fully welded steel along the full length (no flanges creating leak sources). - Pipeline weldings would be in accordance with AS2885 – 2008 Gas & Liquid Petroleum – General requirements. - Pipeline would be designed to withstand full pump "dead-head" with a conservative factor of safety (i.e. no rupture). - Pipeline would be "pigged" after each delivery to extract all fuel from the line so that fuel would not be present when the line is not in use (i.e. diesel). - Pipeline would be installed on a gantry along its full length to minimise the potential for impact from external sources. - Pipeline would be hydrostatically tested to a pressure in excess of operating pressure on completion of construction. - Pipeline transfer would be fully monitored by instruments both on ship and shore facilities (i.e. pressure, flow, etc.). - Pipeline would be painted to protect it against external corrosion.

Site Area/ Operation	Cause	Consequence	Safeguard
			- Nitrogen would be used to purge the line after each transfer.
Fuel storage	- Overfill of tank during tank filling. - Spill of fuel into the bund.	- Potential offsite release, environmental impact.	- Fuel storage is bunded, no offsite release. - Tanks are monitored during filling using level instrumentation (level in tanks repeated in the site office). - All tanks are fitted with high level instruments and alarms (audible and visual in the site office). - Visual inspection and checking of tank/bund area is performed during the transfer/filling operation. - Tank volume is passed to ship for monitoring, ship constantly monitors the transferred volume and notifies shore when volume limit is approaching.
Fuel storage	- Overfill of tank during tank filling. - Spill of fuel onto the bund. - Ignition of fuel in the tank.	- Potential offsite heat radiation impact to surrounding areas. - Tank explosion and tank roof fire. - Explosion overpressure and/or heat radiation impact to surrounding area.	- Fire main (complying with *AS2419 Fire Hydrant Installations*), fire pumps (complying with *NFPA20 Standard for the Installation of Stationary Pumps for Fire Protection*) and fire water tanks. - Fire hydrants and hose reels close to the storage. - Fire hydrants with foam generation installed adjacent to the bund (but at a safe distance). - Fire contained to bund – bund capacity exceeds largest tank in bund (plus sprinkler allowance). - For the diesel storages, diesel is difficult to ignite (low ignition probability). - All tanks would be regularly inspected for potential leaks and corrosion impact, water build up in the tanks would be drained regularly to prevent internal corrosion potential. - Tank level monitoring would be conducted at all times to identify potential rapid tank level loss indicating potential leaks. - All tanks would be fully vented with anti-flash gauze on vents to prevent ignition from entering the tank via the vent. - All electrical equipment in the tank would be suitably specified for the specific hazardous area in which it would be installed (i.e. flameproof equipment installed on tanks and in the bund).

Site Area/ Operation	Cause	Consequence	Safeguard
Combustible liquid transfer pumps (tank farm)	- Pipework, valve or flange leak. - Pump seal leak. - Ignition and fire in bunded area, at pumps.	- Release of fuel to bunded area. - Potential for ignition of fuel leak and fire.	- Pump area is bunded to contain spills. - Fire main (complying with *AS2419 Fire Hydrant Installations*), fire pumps (complying *with NFPA20 Standard for the Installation of Stationary Pumps for Fire Protection*) and fire water tank. - Fire hydrants and hose reels close to the pumps and pipeworks. - Control of ignition sources in the pump bund area (bund would be classified as hazardous area in accordance with *AS60079 Explosive Atmospheres*. - Ignition sources controlled onsite (no smoking, hot work controlled by Permit, vehicle access monitored and controlled).
Tanker loading pipework and pumps	- Pipework, vale or flange leak. - Pump seal leak.	- Release of fuel to bunded area or in area between pumps and gantry. - Potential to impact environment if release escapes offsite.	- Pipework between tanks and pumps is bunded and leaks would be contained within the tanks bunded area. - Pump area is bunded to contain spills. - Pipework between pumps and gantry is located in a spill containment to prevent spills offsite. - Pump operation is only conducted when site is staffed and pump/filling operations can be continually monitored.
Tanker loading pipework and pumps	- Pipework, valve or flange leak. - Pump seal leak. - Ignition and fire in bunded area, at pumps or in area between pumps and gantry.	- Release of fuel to bunded area or in area between pumps and gantry. - Potential for ignition of fuel leak and fire.	- Fire main (complying with *AS2419 Fire Hydrant Installations*), fire pumps (complying with *NFPA20 Standard for the Installation of Stationary Pumps for Fire Protection*) and fire water tank. - Fire hydrants and hose reels close the pumps and pipework. - Fire monitors with foam generation installed adjacent to the pump bund (but at a safe distance). - Control of ignition sources in the pump bund area (bund would be classified as a hazardous area in accordance with *AS60079 Explosive Atmospheres*. - Ignition sources controlled onsite (no smoking, hot work controlled by Permit, vehicle access monitored and controlled).

Site Area/ Operation	Cause	Consequence	Safeguard
	- Tanker impacts gantry. - Tanker driveway whilst connected. - Gantry loading arm failure (leak/rupture - Operator error – incorrect connection of loading arm.	- Release of fuel into the loading bay. - Potential spill and impact to the environment.	- Gantry/loading bay area is bunded to contain spills. - Tanker loading operation is monitored by tanker drivers and terminal operators during the full transfer operations. - Gantry area is under closed circuit television (CCT) surveillance at all times, with screens in the main site office and monitored off site. - Trucks are fitted with driveway protection (tanker gate break) to prevent drivers leaving the Site whilst the truck is connected to the gantry (via the loading arm). - Loading arms are fully tested at installation and maintained continually throughout the plant's life. - Bollard and "Armco" protection at the entry to the gantry/bay area. - Dry break coupling installed on loading arm for connection to the tanker loading point.
Fuel tanker loading bays and gantry	- Fuel leak, ignition and fire.	- Heat radiation impact. - Potential spill and impact to the environment.	- Automatic foam deluge via fusible links in the detection line installed in the gantry area. - Foam sprinkler/deluge system installed over the gantry area. - Fire main, hydrants and hose reels installed in the gantry area. - Control of ignition sources in the gantry area (gantry area would be classified as a hazardous area in accordance with *AS60079 Explosive Atmospheres)*. - Computer controlled filling system operated by the tanker driver using a "swipe-card." - Operator and driver in full attendance during all transfer operations – alarm can be immediately raised in the event of spill and fire. - Emergency button shut down (stops pump and isolates delivery valves) located in the gantry bays.

7.3 Recommendations

The qualitative PHA has made the following recommendations in relation to the safety of the proposed Facility:

- In the event of fire at the fuel unloading berth (NPC - Mayfield 4), it may be necessary to apply fire water to the fire, resulting in water contamination that could be carried into the Hunter River, causing pollution. At this stage of the site development, a detailed Berth spill retention system has not yet been completed. As part of

ongoing design retention of contaminated fire water will be considered and assessed using a fire safety study approach.

- To minimise the requirement for fire water use, a dry chemical powder could be used for smaller fires in the area. Hence, 50kg wheeled dry powder extinguisher would be installed at the NPC Wharf.
- It is noted that foam fire fighting systems are installed in some areas at the site. Foam fire fighting medium is an emulsifying agent, which could emulsify the diesel fuel with the fire water. This could result in failure of the oil separator units at the site stormwater discharge, preventing separation of the diesel from the water. The resultant emulsified liquid may be released to the environment causing impact and damage. A fire safety study would be conducted for the terminal, including potential fire impacts at the NPC diesel fuel delivery wharf.
- Under the provisions of Section 6A of the NSW Occupational health and Safety (Dangerous Goods Amendment) Regulation 2005, it will be necessary to prepare an Emergency Response Plan for the proposed Terminal. Emergencies at the wharf are different to this that would be encountered at the Terminal site. Development of an all encompassing plan may result in a reasonably large document that could be unwieldy (i.e. difficult to find details in an emergency situation). It is therefore recommended that a separate Wharf/Berth emergency plan be developed including spills, potential environmental impact and fires. The plan should be held in a waterproof container at the wharf and be available as part of the wharf operations. The plan should also contain spill response procedures and fire fighting response. Emergency drills/exercises should also be included as part of the plan to be conducted at regular intervals as part of safety preparedness.

8.0 Surface Water Quality

8.1 Existing Conditions

The Site is located at the Port of Newcastle, within the Hunter Estuary at the mouth of the Hunter River. The Hunter River estuary comprises over 100 km of waterways, and its South Arm flows around Kooragang Island. It is the second largest estuary in NSW. Historical land uses have highly modified the nature of the Hunter Estuary, with a range of sediments and pollutants entering the estuary, impacting on water quality and habitat values.

The Site is located adjacent to the South Arm of the Hunter River. The Site is generally flat and has been altered through ongoing remediation works. The Site surface has been raised and re-contoured from the post demolition landform to a free draining landform. The Site has been partly contoured to direct stormwater runoff into the stormwater drains. This has incorporated drainage channels and conduits which are sealed against ingress of contaminated groundwater from the soils (SKM, 2004). The Site is currently un-vegetated.

Two main open earth stormwater drains exist on the former Steelworks Site, the western and eastern drains. The western drain crosses the proposed Site at the north-western end. This stormwater drain was constructed as part of the remediation works. It is approximately 700 m long and remains open for most of its length. It is made from High Density Polyethylene, crushed concrete and soil. A box culvert approximately 220 m in length conveys stormwater beneath the Koppers pipeline to the South Arm of the Hunter River. The main drains were lined to prevent ingress of groundwater into the drainage system (refer Figure 6).

The open sections of the stormwater drain have grassed sloping channel edges which meet benches (between 2.5 and 3 m wide) located in the intertidal zone. The drain has a weir at the downstream end to maintain permanent water (0.1 m AHD) at low tide. Permanent pools created by the weirs and deep water zones located within the channel provide stormwater attenuation and low flow velocities within the channels and promote settlement of sediments. This stormwater drain was designed for the 1 in 100 year Average Recurrence Interval (ARI (*Water Monitoring Results and Preliminary Stormwater Strategy,* AECOM 2010). Stormwater would either infiltrate through the remediated soil profile (crushed rock), or, in the case of run-off, stormwater from the drain would discharge into the South Arm of the Hunter River.

As per the conditions of the 2005 VRA No 26025, the entire Mayfield Concept Approval Site was required to be sealed with an inert capping layer to prevent infiltration of surface water. The capping has been completed for Area 1 (which includes some of the land towards the northern end of the Site). Capping and re-contouring works for Area 2 (the remainder of the Site) is to be completed in 2012 (HDC, 2009). The stormwater management system along with the site capping would provide a barrier minimising groundwater and surface water interaction and have been designed to work together to reduce the amount of rainwater infiltrating the Site, and the movement of groundwater through contaminated soil into the South Arm of the Hunter River. Stormwater quality data are not available for the Site. Given site remediation efforts, it would result in relatively uncontaminated surface runoff. Typically, however, untreated stormwater is known to be high in nutrients and TSS.

Berth M4 is a 265 m long berth with a 10,000m^2 hardstand area for cargo handling. M4 has a stand-alone stormwater management system consisting of source control devices for the capture and retention of contaminants as well as biofiltration swale to collect water from the hardstand. The surface levels were designed and constructed to be free draining to drainage pits to ensure stormwater does not collect at low points. The pits are connected to the stormwater management system and the quality of the water discharged to the South Arm of the Hunter River is governed by the concentration limits contained in the EPL for M4.

A Stormwater Management Plan (SWMP) would be prepared for the facility in accordance with Patterson Britton & Partners (2007) and *Water Monitoring Results and Preliminary Stormwater Strategy* (AECOM 2010). The stormwater management system is also described in Section 3.6.11.

8.2 Predicted Impacts

Construction

It is anticipated that runoff from the Site would be minimal during construction due to the remediated substrate and the flat topography. Nevertheless, runoff from disturbed, remediated areas has the potential to cause erosion, sedimentation and siltation.

Surface water may be impacted during construction as a result of the following activities:

- Stripping of topsoil.
- Working in areas where soils and substrate have not been stabilised.
- Storage and operation of machinery including backhoes, excavators, cranes and pile drivers.
- Stockpiling of excavated material.

Operational

Minor spills outside the bunded areas, truck loading gantry and roadways may result in poor quality stormwater runoff in a rain event. Poor quality stormwater may potentially leave the Site in the event that stormwater is not controlled. Uncontrolled stormwater leaving the Site has the potential to degrade water quality in the nearby Hunter River.

The areas identified as potentially impacting on the quality of stormwater leaving the Site are:

- Stormwater from the Tank Farm (TF).
- Stormwater from the concrete driveways trafficked by tankers.
- Stormwater from the Road Tanker Fill Stands (RTFS) and pump bay.
- Stormwater from the emergency access roads.
- Stormwater from building roofs and car park.

The proposed stormwater management system is described in the SWMP (Patterson Britton & Partners, 2007). The SWMP would be designed to prevent pollution entering the Hunter River through effective design of stormwater controls, appropriate staff training and suitable water quality monitoring and testing. These measures are discussed in detail in Section 3.6.11.

8.3 Environmental Safeguards

Construction

Surface water from the NPC access road would be discharged via the existing stormwater system. To manage run-off from the road that may contain a high level of suspended sediments or nutrients, retention-filter devices such as straw bales would be placed upstream of the stormwater grate. Roadways would also be routinely cleaned to minimise sediment tracked onto the road.

Prior to the construction phase of the proposal, a CEMP would be developed. This plan would provide details on the strategies to be implemented onsite during the construction phase to emissions. The CEMP would include a detailed erosion and sediment control plan that would be put in place prior to the disturbance of the Site. The plan would ensure that clean water is diverted around the Site, whilst surface water on disturbed areas would pass through appropriate sediment control devices. Consequently sediment control fencing would be fixed to the security fencing around the perimeter of the Site. This is to manage suspended sediments or other contaminant content in runoff.

Operational

The stormwater system would be designed to provide the effective containment of stormwater from the Site, to prevent leaks and spills which may occur from discharging to the river and to facilitate the discharge of only clean stormwater to the Hunter River. Some captured stormwater may be used to irrigate the small amount of landscaped areas on the Site. The stormwater management system would be designed and implemented according to Newcastle City Council design criteria, principles set out in the Contaminated Site Management Plan, and in consultation with the OEH.

To enable clean stormwater is discharged from the Site, stormwater originating from different onsite catchments would be segregated, tested and treated accordingly.

Key aspects of the stormwater management system would include:

- Containment of rainwater from TF.
- Containment of stormwater and spills from RTFS and pump bay.

- First flush system for stormwater from hard stand areas (outside of bunds).
- Prevention of spills.
- Testing of water quality prior to release to the Hunter River of contained and treated stormwater.
- Water quality monitoring.
- Handling and disposal of potentially contaminated stormwater and fire water.
- Segregation of any water drained from diesel tanks for offsite disposal.
- System maintenance.
- Contingency plans for the management of potentially contaminated stormwater.
- Staff training.

The system comprises numerous containment areas which are described in Table 11 each with its own specific procedure and testing regime. This has been developed in accordance with the Marstel Business Management System which incorporates all procedures and work instructions.

Table 11 Stormwater Containment Components

Area	Description	Inspection	Testing
Tank Farm (TF)	Water accumulated within each tank bunded area.	Routine inspection prior to release to API Separator. Visual inspection for suspended solids, hydrocarbons, grease, foam, visible floating oil, litter.	Insitu testing by terminal staff for: - pH - Dissolved oxygen - Electrical conductivity
API Separator (APIS)	Final treatment and emergency stop release from TF.	Routine inspection and testing prior to release to OP. Visual inspection for suspended solids, hydrocarbons, grease, foam, visible floating oil, litter.	Laboratory testing for: - pH - TDS - TPH - Suspended Solids
First Flush Containment Pit (FFCP)	Collects first flush water from concrete driveways.	Routine inspection prior to reaching capacity and release to CPIS. Visual inspection for suspended solids, hydrocarbons, grease, foam, visible floating oil, litter.	Insitu testing by terminal staff for: - pH - TDS - Dissolved oxygen
Coalescing Plate Interceptor Separator (CPIS)	Receives water from the FFCP, TSCP & Dewatering tank.	Routine inspection and release to APIS. Visual inspection for hydrocarbons, oils, grease and sedimentation.	No testing required. All water released to APIS for testing
Truck Fill Spill Collection Pit (TSCP)	Collection of accidental spills, fire water and Pump Bay.	Routine inspection prior to reaching capacity and release to the CPIS then APIS and finally OP. Contaminated water disposed offsite. Clean water released to APIS.	Insitu testing by terminal staff for: - pH - Dissolved oxygen - TDS

Area	Description	Inspection	Testing
Outlet Pit (OP)	Final discharge point to the Hunter River.	Routine visual inspection to ensure water is free of visual contaminants.	This would be the monitoring point for EPL requirements. *Insitu* testing of: - *Insitu* testing by terminal staff for: • pH • Dissolved oxygen • TDS

In the event that stormwater is not suitable for release to the Hunter River, the contaminated water would be disposed of offsite by a licensed contractor. The remaining water would be retested and, if clean, discharged to the river via the OP.

8.4 Residual Impacts

The residual impacts determined for surface water quality, based on the proposed measures to be implemented during construction and operation is predicted to be minimal. The SWMP for the facility is based on previous SWMPs developed for other Marstel operational sites. This system has proved to be extremely effective in managing stormwater, with no reportable incidents recorded.

8.5 Conclusion

The management of surface water during operation has been addressed through the preparation of a SWMP. The SWMP provides the framework to effectively manage the potential pollution of receiving waters from onsite stormwater through effective design of stormwater controls, appropriate staff training and suitable water quality monitoring and testing. In addition a CEMP would be developed prior to the initiation of construction, which would detail onsite control measures to protect surface water quality to the Hunter River.

9.0 Air Quality, Odour and Greenhouse Gas

An Air Quality Impact Assessment (AQIA) was prepared by AECOM for the Bulk Fuel Storage Facility in July 2008. This AQIA was prepared when the proposed Facility was to contain petroleum and diesel. As the proposed Facility would now contain only diesel and biodiesel, an updated AQIA was prepared in July 2011. This AQIA is summarised below and attached at Appendix F.

9.1 Existing Conditions

Newcastle's air quality has improved in recent years following the cessation of steel manufacturing in the area. A number of pollutant sources remain, however, including industrial, domestic and transportation activities, with motor vehicles considered to provide the greatest emission load to local air sheds. The primary pollutants of concern in the Newcastle airshed are particulate matter and photochemical smog/ozone and its precursors (oxides of nitrogen and VOCs). Industrial emissions sources include the nearby Orica and Incitec plants, and the Tomago Aluminium smelter. Dust emissions arise from the coal and grain terminals, while odour emissions from seed processing (Cargill) and coal tar processing (Koppers) commonly affect the Mayfield and Kooragang Island areas. There are currently three fuel storage facilities in Newcastle: Caltex (Wickham), BP (Carrington) and Shell (Hamilton), which are located adjacent to or near to residential areas.

The pollutants of prime concern in NSW are ozone and particulates, with levels of these pollutants approaching or exceeding the national standards prescribed in the National Environment Protection Measure for Ambient Air Quality (NEPM) on occasion. Pollutant levels in Newcastle, however, are generally acceptable, with few exceedences noted. The Marstel facility will not generate significant levels of ozone or particulates and, as such, these pollutants are not considered further in this assessment. The OEH measured ambient concentrations of benzene in the Newcastle region between 1996 and 2001. As described in Section 9.2, benzene has been used as a representative organic compounds (VOC) to carry out the AQIA for the Proposed Facility. Average background benzene concentrations were approximately 0.8 ppb (2.6 $\mu g/m^3$), which is less than 10% of the guideline level for this pollutant. As the concentration of benzene in fuel has been reduced by a factor of five since the completion of the EPA study, and no significant alternative sources of benzene have been added to the area, current background concentrations are expected to be less than those reported by the OEH (as late as 2001). In order to provide a conservative assessment, however, the background airshed concentration of benzene adopted for this study was 2.6 $\mu g/m^3$.

9.2 Methodology

The main emissions of concern for fuel storage activities are volatile organic compounds (VOCs). These are organic compounds which can act as precursors in the production of photochemical smog. VOCs can be emitted from storage tanks, filling stations vents, pipelines and process equipment leaks associated with fuel storages. Typically, VOCs are largely sourced from petroleum fuels.

Emissions of pollutants of concern from the diesel and biodiesel tanks are not expected to be significant as these fuels are low volatility liquids. Significantly, and unlike many other petroleum products, there would only be low levels of VOCs emanating from tanks storing diesel and biodiesel. Therefore, no Vapour Recovery Unit would be required and these tanks would be fitted with standard pressure vacuum protection venting directly to atmosphere. Emissions during tank filling would be released straight to atmosphere, without the need of a VRU.

The predicted emission rates released from the truck filling stand have been modified from the original AQIA to represent untreated stack concentrations measured at a similar existing Marstel facility to that which is proposed in Mayfield. The TANKS emissions estimation model was used to calculate the predicted total VOC emissions from the storage tanks. The OEH document *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (OEH 2005) was used to predict the Ground Level Concentrations (GLC).

The OEH does not have a criterion for collective VOCs, rather provides impact assessment criteria for a number of individual types of VOCs. No data regarding the speciation of VOCs in diesel and biodiesel fuels, however, were available at the time of this assessment.

In order to assess the potential effects of VOC emissions from the proposed facility, benzene was chosen as an indicator pollutant due to its potential toxicity, and its strict OEH assessment criteria. A value of 11% of the total tank VOCs estimated was conservatively assumed to be benzene and the results compared against the benzene criteria. The estimated maximum Polycyclic Aromatic Hydrocarbon (PAHs) value in diesel is 11%, therefore

modelling benzene as 11% will result in a very conservative modelled estimate of VOC impacts from the Facility. This allowed the model to predict the worst case concentration of the specified pollutant.

The meteorological data have been updated from the 1995 BHP sourced data used in the AQIA. Data from the Newcastle OEH monitoring station for the calendar year 2009 has been applied in the assessment. Data from this site are considered to be representative of meteorological conditions around the Newcastle Harbour area. The dispersion model building wake input data have also been updated to reflect the new proposed site layout.

9.3 Predicted Impacts

The following predictions arise from the conservative adoption of benzene as an indicator of potential VOC concentrations, subject to the qualifications provided above.

The results of the dispersion modelling are summarised in Table 12, which lists the maximum concentrations of benzene predicted by the dispersion model at the specified sensitive receptor locations. Concentrations of benzene resulting from the facility's estimated emissions and cumulative concentrations (i.e. including existing background benzene concentrations) are shown. An isopleth plot of the predicted concentrations is shown in Figure 2 of the AQIA; it should be noted that the contours shown in Figure 2 of the AQIA represent emissions from the facility alone rather than cumulative concentrations. However the maximum possible cumulative concentration is given in Table 12.

Table 12 Predicted Maximum Receptor Benzene GLC (µg/m^3), modelled outputs for conservative scenario

Receptor	Predicted Maximum Receptor Benzene GLC (µg/m^3)	
	Facility Only	Cumulative Concentrations
1	5.6	8.2
2	8.7	11.3
3	3.6	6.2
4	3.9	6.5
5	3.5	6.1
6	2.5	5.1
7	2.5	5.1
8	2.6	5.2
9	2.6	5.2
10	2.7	5.3
11	1.8	4.4
12	2.1	4.7
13	1.7	4.3
14	1.8	4.4
15	5.0	7.6
16	3.4	6.0
17	4.1	6.7
OEH Criterion	**29**	

Benzene concentrations for the area surrounding the proposed terminal were predicted to be well below the assessment criterion at all modelled sensitive receptor locations. It should be noted that the assessment was conservative – the modelling assumed the facility was emitting benzene from the diesel product continuously, and emission rates were conservatively estimated at rates expected to be around three times higher than likely emissions. As benzene was used as an indicator pollutant, the results suggest no adverse impacts could occur from emissions of VOCs from the proposed product storage at ground level at the proposed facility.

9.4 Climate Change and Greenhouse Gas Assessment

Greenhouse gases (GHGs) are gases found in the atmosphere that absorb heat that is reflected from the earth's surface. The primary greenhouse gas is carbon dioxide (CO_2). Different GHGs have different heat absorbing capacities. In order to achieve a basic unit of measurement, each GHG is compared to the absorptive capacity of CO_2, and measurements and estimates of GHG levels are reported in terms of CO_2 equivalent emissions (CO_2-e).

Australia's National Greenhouse Gas Inventories are designed to provide estimates of Australia's net GHG emissions and track Australia's progress towards its internationally-agreed GHG reduction targets. Australia has published annual national GHG inventories for each year from 1990 to 2009 inclusive. In 2009 (the latest available data), Australia's total GHG emissions were estimated to be 564.5 Mt CO_2-e. Of these emissions, approximately 8% (44.8 Mt CO_2-e) were attributed to the transport sector.

Estimation of the GHG emissions associated with the proposed terminal's operations was undertaken using the emission factors and methods outlined in the NGA Factors[11]. The National Greenhouse Accounts (NGA) Factors provide three types of assessment categories:

- **Scope 1**, which covers direct emissions from sources within the boundary of an organisation, such as fuel combustion and manufacturing processes;
- **Scope 2**, which covers indirect emissions from the consumption of purchased electricity, steam or heat produced by another organisation; and
- **Scope 3**, which includes all other indirect emissions that are a consequence of an organisation's activities but are not from sources owned or controlled by the organisation; that is, emissions associated with the production of fuels, and emissions from the generation of purchased electricity.

The main operations likely to generate GHGs at the proposed terminal are:

- Electricity to run plant operations such as administration buildings, fuel pumps, and plant lighting (Scopes 2 and 3);
- Delivery and distribution of fuels via road and ship tanker (Scope 3);
- Passenger vehicles transporting staff to and from site (Scope 3); and
- Combustion of fuels distributed from the facility (Scope 3).

Estimation of emissions associated with electricity use, and fuel consumption are detailed below.

9.4.1 Electricity Consumption

The facility was assumed to use 204,000 kWh of electricity per year. Emissions of GHGs associated with this consumption were estimated at approximately 216 t CO_2-e per year as shown in Table 13.

Table 13 GHG Emissions from Electricity Use

Emissions Type	Emissions Factor* (kg CO_2-e/kWh)	GHG Emissions (t CO_2-e)
Scope 2	0.89	181.6
Scope 3	0.17	34.7
Full Fuel Cycle (total)	**1.06**	**216.2**
* Latest estimate for consumption of electricity in NSW. Source: Table 39, NGA Factors, July 2011		

9.4.2 Fuel Consumption

Delivery and Dispatch of Fuel

The GHG estimates were made assuming delivery and dispatch trucks would be rigid diesel tankers, with approximately 5,100 trucks per annum for diesel dispatch and 1,100 trucks per annum for biodiesel receipt and dispatch. Each truck was assumed to travel 200 km, with a fuel consumption rate of 0.285 L/km[12]. Total emissions associated with truck movements were estimated to be 959 t CO_2-e per year as shown in Table 14.

Table 14 Emissions – Delivery and Dispatch by Truck

GHG	Emissions Factor (kg CO2-e/GJ)	Energy content Factor	Emissions * (t CO2-e/year)
CO_2	69.2	38.6	950
CH_4	0.2		3
N_2O	0.5		7
Combined			959
* Source: Table 4, NGA Factors, July 2011			

The estimated emissions associated with the delivery of diesel by ship are shown in Table 15. A conservative model was assumed whereby the diesel would be delivered by 15 ships per year, with each tanker travelling for two days in total (estimated ship deliveries in 2013 would only be 8 per annum). Each ship was assumed to use burn 36 tonnes of diesel fuel per day[13]. Emissions associated with shipping were estimated at 2,857 t CO_2-e per year.

Table 15 Scope 1 Emissions – Delivery of Diesel by Ship

GHG	Emissions Factor (kg CO2-e/GJ)	Energy content Factor	Emissions * (t CO2-e/year)
CO_2	69.2	38.6	2,828
CH_4	0.2		8.2
N_2O	0.5		20.4
Combined			2,857
* Source: Table 4, NGA Factors, July 2011			

Staff Movements

Emissions associated with staff commuting to and from the site were estimated as shown in Table 16, assuming that three petrol-powered cars would be driven 20 km each way to the site for 5 days per week. Total commuting emissions were estimated at 14 t CO_2-e per year.

Table 16 Scope 1 Emissions – Passenger Vehicles for Commuting Staff

GHG	Emissions Factor (kg CO2-e/GJ)	Energy content Factor	Emissions * (t CO2-e/year)
CO_2	66.7	34.2	13.5
CH_4	0.6		0.1
N_2O	2.3		0.4
Combined			14
* Source: Table 4, NGA Factors, July 2011			

Consumption of Marstel Fuel by End Users

Indirect emissions of GHGs will also occur due to the use of the fuels distributed by the facility. These Scope 3 emissions were estimated as shown in Table 17.

The NGA Factors do not provide Scope 3 emission factors for biodiesel fuels as the emissions are highly dependent on individual plant and project characteristics. Previously published data indicate that the emission factors and associated emissions from biodiesel are lower than for diesel[15]. As such, for this assessment, the emission factor for Scope 3 emissions from the consumption of the biodiesel fuel was conservatively assumed to be the same as that for diesel fuel consumption, i.e. 5.3 kg CO_2-e/GJ. Total emissions associated with consumption of the fuel supplied by Marstel were estimated to be 118,038 t CO_2-e per year.

Table 17 Scope 3 Emissions - Consumption of Fuel Distributed by Proposed Facility

Fuel type	Emissions Factor (kg CO2-e/GJ)	Energy Content Factor ^ (Gj/kL)	Throughput		GHG Emissions (t CO2-e/year)
			ML	kL	
Diesel	5.3	38.6	264	264,000	54,009
Biodiesel	5.3	34.6	36	36,000	6,602
Total					60,611
* Table 38, NGA Factors, July 2011 ^ Table 4, NGA Factors, July 2011					

9.4.3 GHG Emission Summary

The total estimated GHG emissions associated with operation of the proposed facility is shown in Table 18. As shown, the total emissions were estimated at 0.12 Mt CO_2-e per year, equating to approximately 0.02% of the total Australian emissions (564.5 Mt CO_2-e) and 0.3 % of the total transport emissions in Australia in 2009 (44.8 Mt CO_2-e). The greatest contributor to emissions was the consumption of the fuel supplied by Marstel by end users.

The relationship between GHG concentrations and climate change is very complex and nonlinear. As such, the effect of the emission of this amount of GHGs on the environment or climate change cannot be estimated. The proposed project represents a very minor source of GHG emissions, both in terms of the economic sector emissions and Australia's national emissions. Furthermore, the proposed project may potentially decrease net GHG transportation emissions as the proposed facility will be located closer to its markets than current fuel providers, thereby reducing the truck transportation distance required to supply fuel to service stations. Bulk fuel transportation via ships allows efficient fuel transport to the Port of Newcastle and shorter distribution corridors from Mayfield. As such, the proposed project is not expected to significantly affect the environment.

Table 18 Direct and Indirect GHG Emissions Summary

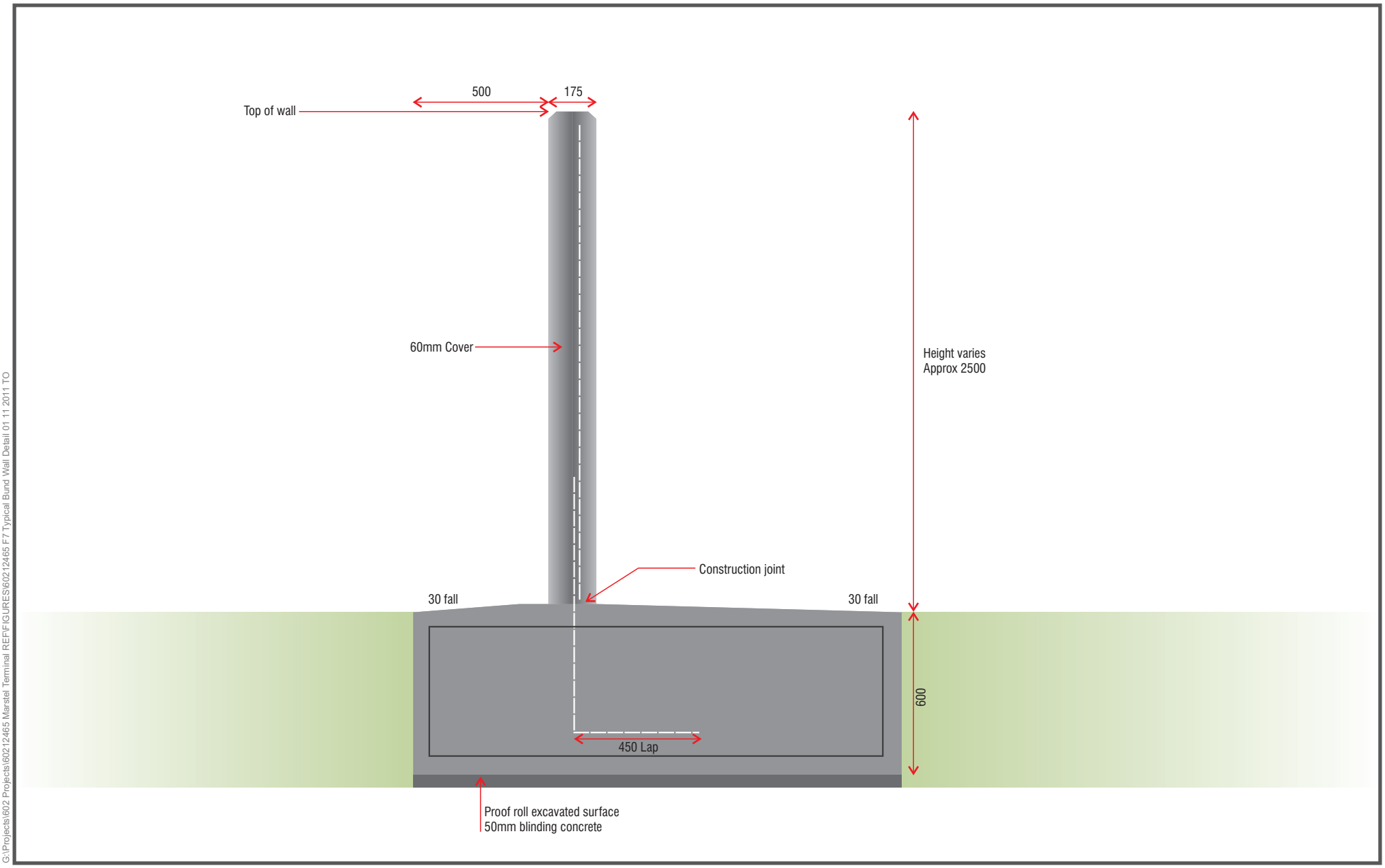
Activity	Estimated GHG Emissions(t CO_2-e/year)
Direct Emissions from the Proposed Facility	
Electricity	216
Fuel consumption – delivery and dispatch (truck)	959
Fuel consumption –delivery (ship)	2,857
Fuel consumption –staff commuting	14
Total Direct Emissions	4,046
Indirect Emissions from the Proposed Facility	
Fuel consumption by end users	60,611
Total Indirect Emissions	60,611
Direct and Indirect Emissions from the Proposed Facility	
Total Emissions	64,657

9.5 Conclusions

This assessment investigated the air quality impacts of the proposed project on surrounding receivers, and estimated the potential emissions of GHGs associated with the facility's activities. The assessment of air emissions was limited to VOCs during operation of the proposed facility, as emissions associated with construction works for the project would be expected to be easily managed through standard construction practices, and odour was not considered likely to be an issue at sensitive receptor locations due to the fuels proposed to be stored and the distance between the facility and sensitive receptors. Benzene was chosen as an indicator species for VOCs, and was the only pollutant modelled. Benzene concentrations at sensitive receptor locations were estimated through dispersion modelling using the AUSPLUME program.

The results of the conservative modelling predicted that cumulative benzene concentrations would reach less than 40% of the OEH guideline criterion at any sensitive receptor location. As such, no significant air pollutant impacts on the surrounding environment would be expected from the proposed development.

The GHG assessment considered emissions associated with electricity and fuel consumption. Fuel consumption included fuel use for the delivery and dispatch of fuels to/from the site by truck and ship; fuel used by staff commuting to and from the site; and the consumption of the fuel by customers. The burning of Marstel's product fuel was the source of 98% of the total GHG emissions associated with the proposed facility, amounting to an estimated 0.118 Mt CO_2-e per year. The facility's total GHG emissions (0.12 Mt CO_2-e per year) were found to represent a very small proportion (0.3%) of emissions from the transport sector (44.8 Mt CO_2-e per year) and Australian emissions as a whole (0.02% of 564.5 Mt CO_2-e). Additionally, the proposed project may serve to decrease net GHG transport emissions as the proposed facility will be located closer to its markets than current fuel providers, thereby reducing the truck transportation distance required to supply fuel to service stations. The proposed project is not, therefore, expected to significantly adversely affect the environment.



G:\Projects\602 Projects\60212465 Marstel Terminal REF\FIGURES\60212465 F7 Typical Bund Wall Detail 01 11 2011 TO

AECOM

TYPICAL BUND WALL DETAIL

Environmental Assessment
Port of Newcastle, New South Wales

FIGURE 7

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10.0 Groundwater

10.1 Existing Conditions

The Site has been partly contoured and capped to direct stormwater runoff into the stormwater drains as outlined in Section 8.1. Much of the Site has already been capped, with the remaining capping planned for completion by 2012. A subsurface wall between Areas 1 and 2 prevents the movement of groundwater between the two areas. Such measures collectively reduce surface water infiltration and interaction with any contaminated groundwater, and prevent the movement of groundwater through contaminated soils and into the South Arm of the Hunter River.

Below the capping there is a fill layer. Beneath that there are three groundwater aquifer layers which are characterised by low to very low permeability. The fill aquifer lies below the capping and ranges in thickness by up to 5 m and contains contaminated soils. It generally flows in a north to north-easterly direction towards the South Arm of the Hunter River. There is some vertical interaction with the underlying estuarine aquifer. The estuarine aquifer is located in the estuarine clay and sand deposits between the fill material and bedrock layer. The groundwater flows through this layer in a north to north-easterly direction towards the South Arm of the Hunter River and is influenced by tidal channels and drains. The bedrock aquifer is a low permeability aquifer situated within Tomago Coal Measures. The groundwater flow is generally north to north-easterly towards the South Arm of the Hunter River and there is also some upwards vertical interaction with the estuarine aquifer (URS, 2000 *Development of a Multi Purpose Terminal and Remediation of the Closure Area, BHP Newcastle Steelworks.*

Part of the Mayfield Concept Approval Area, known as Area 1, contains a groundwater plume which is the more highly contaminated part of the Mayfield Concept Approval Site. In 2008, a subterranean barrier was constructed of soil and bentonite on the boundary between Areas 1 and 2 of the Mayfield Concept Approval Site to contain contamination in this Area by blocking the horizontal flow of groundwater. This barrier is approximately 1.4 km long and has a depth of approximately 20-49 m from the ground surface to the natural sand and alluvial deposits. It minimises groundwater flow from Area 2 into Area 1. The proposed Marstel Facility lies predominantly in Area 2.

The barrier was designed to accommodate a sustained traffic load equivalent to SM1600 (as outlined in *AS5100 Bridge design – Scope and general principles*) applied to any location(s) on the existing ground surface, including asymmetrical loadings. The SM1600 design loading is equivalent to a 3.2 m wide sustained loading of 36kPa (HDC, 2009). Part of this barrier wall underlies the eastern part of the Site. 9

The installation of the capping layer and the subterranean barrier wall has caused groundwater levels in fill materials to be lower inside the wall as compared to outside (SKM, 2004). Groundwater outside the barrier is diverted around the enclosed Area 1 towards the South Arm of the Hunter River, as the barrier acts as a low permeability pathway for groundwater flow and water flows along the outside of the barrier as opposed to through the barrier. The objective is for contaminants in Area 1 to remain *insitu* thereby less likely to be mobilised to discharge to the South Arm of the Hunter River.

Tidal impacts on groundwater depend on the level of groundwater compared to sea level. Previous investigations within the Mayfield Concept Approval Site yielded little evidence of interaction between tidal river water and shallow groundwater (URS 2000). Groundwater flow is from the northeast to northwest for the northern two-thirds of the Mayfield Concept Approval Site and from the east to the south for the remainder of the Mayfield Concept Approval Site. Groundwater flow velocity on the Site is generally slow and is estimated to be approximately 5 m/year (SKM, 2004).

According to Appendix F of the CSMP, a groundwater monitoring bore is located on the proposed Site along the Western Drain. Groundwater levels at this part of the Site are approximately 0.55m AHD. Groundwater quality at the Site has historically been poor as a result of industrial contamination. Areas within the Mayfield Concept Approval Site have shown elevated concentrations of PAHs, phenolic compounds and benzene, toluene, ethylbenzene and xylene (BTEX). Heavy metals and ammonia concentrations have previously been found to be above guideline criteria. These exceedances have largely occurred in Area 1, indicating that organic contamination at the Mayfield Concept Approval Site is predominantly contained within the barrier wall.

10.2 Predicted Impacts

The uppermost aquifer beneath the Site is semi-confined with the annual average groundwater level (AAGWL) lying at approximately 0.5 m AHD. The capped surface of the Site currently lies at approximately 1.9 m AHD. The proposed works would involve excavation to a depth of approximately 1.3 m AHD, which would continue to lie

around 0.8 m above the AAGWL. Any impervious capping would be reinstated once intrusive works during construction are complete.

Contaminants of particular concern on the former BHP Steel works site were Polycyclic Aromatic Hydrocarbons (PAHs). Previous investigations undertaken in the vicinity of the proposed Site indicated PAHs in groundwater occur in the range of 3-50 µg/L (SKM 2004).

10.3 Environmental Safeguards

The following requirements from the Contaminated Site Management Plan (CSMP) (HDC, 2009) apply to the barrier wall area and easement (shown in Figure 6). The proposed development would adhere to these conditions which are summarised in Table 19 which is to ensure the integrity of the subterranean barrier wall. Area E refers to the easement to provide for access and maintenance. Area F is a restricted area either side of the barrier wall.

Table 19 CSMP Barrier Wall Requirements

CSMP References	Requirements
Requirement 15.1.1 – Easement (applies to Area E)	Any plan of subdivision or lease is to maintain an easement for access and maintenance over Area E which as a minimum benefits the State authorities and other public authorities and their respective invitees. This easement is to have a total width of 15 m, comprising 5 m on that side of the subterranean barrier wall which is within the inside of the containment area and 10 m on the other side (i.e. that side of the barrier wall which is exterior to the containment area). Access to the easement would be maintained by the proposal.
Requirement 15.1.2 – Restriction on surface development (applies to Area F)	Work is not to include any activity that would result in a combination of dead and live loads that are in excess of the design load for the surface completion beam unless: - A geotechnical engineer has provided written certification that there would be no adverse effect on the subterranean barrier wall or cap or surrounding ground. The people to whom this certification is addressed must include the State and the site auditor; - A structural engineer with appropriate qualifications and experience has certified that the design of the work takes account of ground movements predicted by the geotechnical engineer and that the works would not damage the subterranean barrier wall or beam. The people to whom the certificate is addressed must include the State and the site auditor; - The site auditor is satisfied that the work would not adversely affect the subterranean barrier wall or beam; or - The State is satisfied that the work would not adversely affect the subterranean barrier wall or beam.
Requirement 15.1.3 – Works to be designed for differential settlement (applies to Area F)	Works must be designed to allow for any differential settlement that may occur as a result of deformation of the subterranean barrier wall under load.

CSMP References	Requirements
Requirement 15.1.4 – Control of Works affecting capping beam (applies to Area F)	Works that involve trenching or excavation through the capping beam must include: a) appropriate controls and work methods to minimise damage to the beam; and b) appropriate design to replace or reinstate the beam to ensure that the functionality of the beam, subterranean barrier wall and cap is not adversely affected.
Requirement 15.1.5 – Geotechnical Engineer Certificate (applies to Area F)	A geotechnical engineer's certificate must be obtained: a) certifying that the design of the Works comply with the requirements of this Table; and b) upon completion of the works, certifying that the beam has been reinstated properly. The people to whom each certificate is addressed must include the State and the site auditor.
Requirement 15.1.6 – Piles and footings (applies to Area E)	To protect the integrity of the subterranean barrier wall, no foundations are permitted (both pile and pad foundations) that penetrate into the surface completion beam or subterranean barrier wall. An exclusion zone either side of the subterranean barrier wall has been established for both pad and pile foundations that exceed the above design load for the surface completion beam. Foundations within the exclusion zone may be allowable, subject to analysis and certification by a suitably qualified geotechnical engineer that there would not be any adverse affect on the subterranean barrier wall or surrounding ground and with the written consent of HDC. Where foundations are required in this zone they must not be within 15 metres (or greater if required) of the subterranean barrier wall outside alignment. No guarantee on the performance of the existing surface completion beam or subterranean barrier wall is given. For all foundation design works, designers must make their own estimates on the bearing capacity and potential for both total and differential settlements that may occur as a result of deformation of the wall under load and make such allowances in their designs to accommodate such conditions. Any plan of subdivision or lease is to create a restriction on use within Area F consistent with the above restrictions. No work may be carried out that involves excavations or trenches at or below 2 m AHD.

Excavations on the Site would mainly be required outside the subterranean barrier i.e. Area 2, where groundwater contamination is lowest. However, if any groundwater is encountered during excavation for the proposed first flush pit, truckfill stand retention or the API separator, dewatering may be required. This depth to groundwater due to proximity to the Hunter River is also likely to be dependent on the seasonal fluctuation and tidal movements.

Prior to dewatering, the water would be tested for the range of potential contaminants of concern. In the event that contaminants prove to exceed criteria, water would be removed offsite by a licensed contractor. This would involve a suction tanker extracting the contaminated groundwater and removing to an offsite facility for appropriate disposal.

If groundwater quality is below the criteria, it is proposed to dispose directly by pumping to the existing box culvert on the western boundary of the Site, with prior consultation with Newcastle City Council, and according to the conditions set out in Marstel's anticipated EPL under the POEO Act. Disposal via the existing stormwater system would not result in any potential erosion or scouring due to water release.

Marstel also propose to install a total of four monitoring wells, two upstream and two downstream of the Site as part of the monitoring program for the Site. Application for a licence to install these wells would be made to the Water Administration Ministerial Corporation under Part 5 of the *Water Act 1912* (refer Section 4.3.8).

Once operational, groundwater onsite would be protected through the installation of the claymax liner as described in Section 3.6.2. The claymax liner would create an impervious seal across the Site and would run up the sides of the bund wall (Figure 6). In the event that there is spillage of any product on the Site, it would be contained within the Site and managed appropriately.

Groundwater management is also to be undertaken in accordance with *NSW Groundwater Quality Protection Policy* (DPI 1998) in which the objectives are to protect the groundwater resource in NSW. The implementation of these safeguards would manage risks in relation to the existing groundwater onsite.

10.4 Residual Impacts

Control measures such as the implementation of ongoing monitoring and construction of an engineered liner form part of the proposal. It is unlikely that there would be residual impacts from the proposed facility on groundwater beneath or adjacent to the Site. Any groundwater that is intercepted that requires dewatering would be treated according to the method outlined in Section 10.3.

10.5 Conclusions

Based on the review of the available information for the Site, it is considered that the existing groundwater at the Site does not pose a risk to the Proposed Project and vice versa. Additionally, the construction and ongoing management of the proposal would not adversely impact the quality of the existing groundwater with the implementation of the identified design, construction and operational control measures.

11.0 Soils and Acid Sulfate Soils

11.1 Existing Conditions

Soils on the Site have been highly disturbed through past industrial activities and are characterised by fill material of variable thickness underlain by marine and estuarine sediments and Tomago coal measures. Site reclamation was undertaken between 1866 and 1940. Reclamation fill extended from the surface to a depth of approximately 10 m and includes coal washery rejects, copper slag, fly ash, rubble, iron and steel-making slags and process wastes, boiler ash, general waste and building debris from industrial facilities and sand dredged from the South Arm of the Hunter River (SKM, 2004). This fill material arose from previous industrial uses and is currently part of ongoing remediation activities.

Estuarine sediments of inter-bedded soft to firm clays, silt and sand are located beneath the fill material. These sediments lie above very stiff to hard silt clays at around 15-16 m deep and, in some locations, extend to well below 20 m. Bedrock underlies these sediments.

The Site has been subject to numerous site investigations to determine soil contamination during the decommissioning and remediation phases of the former BHP Steelworks Site. The result of these investigations identified areas of higher contamination which related to the previous activities undertaken as part of the steelworks operations. Two remediation areas were delineated which were Area 1 and Area 2, as outlined in Section 10.1. Stage 1 of the remediation activities has been completed. Stage 2 is currently underway and is expected to be completed in 2012 in line with development (HDC, 2010).

PAHs were identified as the only group of contaminants present in the surface fill layer at sufficiently high concentrations to warrant remediation prior to development of the Mayfield Concept Approval Site. High concentrations of VOCs such as BTEX were also identified at greater depths at the Site. Tar-like materials and asbestos materials were also identified at the former steelworks site. The concentrations of these contaminants in the fill material were found to be greatest in Area 1.

To date, remediation in Area 1 has involved surface contouring, surface drainage works, complete surface capping and installation of the vertical subterranean barrier surrounding the entire land based perimeter of Area 1. The eastern section of the proposed terminal facility and part of Lot 1 is located above soils in Area 1. In order to provide increased safeguards against the contamination concentrated at Area 1, two different types of caps have been provided for Area 1. A 0.5 m thick layer of Virgin Excavated Natural Material (VENM) was used on the south-western portion of Area 1, which was constructed to finished surface levels for remediation. A paved cap was used for the remainder of Area 1. The paved cap layer is comprised of 300 mm granular site material overlain with 100 mm of 20 mm sized crushed concrete sealed with a bituminous two-coat seal to meet the permeability required by the VRA No 26025 (HDC, 2009). The paved cap was constructed to a level 400 mm below the finished surface levels, allowing air space for the construction of additional pavement thickness during subsequent project works, as may be required for heavy duty hardstands (HDC, 2009).

The remainder of the terminal facility is located on Area 2. Remediation in Area 2 has undergone progressive surface contouring, proposed surface drainage works, and low permeability capping.

A review of the *NSW Acid Sulfate Soil Risk Maps* for the Newcastle area was also undertaken. Potential acid sulfate soils (ASS) are waterlogged soil layers rich in iron sulphide, primarily pyrite. They generally occur in low lying coastal areas. When excavation or drainage exposes these soils to oxygen, pyrite becomes oxidised to form sulphuric acid. If this concentration of sulphuric acid is enough to exceed the neutralising capacity of the soil, the soil pH can become acidic. This is then known as Actual ASS. The review of ASS mapping for the Newcastle area identified that:

- There is a high risk of occurrence of ASS in soils at a depth of up to 1 m in the area to the south and south-west of the Mayfield Concept Approval Site.
- There is a low risk of occurrence of ASS in soils at a depth of greater than 4 m in the area south-west of the Mayfield Concept Approval Site.
- There are no ASS identified at the Mayfield Concept Approval Site.

Thus, no further hazard assessment or mitigation measures for ASS are required for this Site.

11.2 Predicted Impacts

The predicted soil impacts of the proposed development may include:

- Earthworks (including excavation) and installation of stormwater drainage channels, services and access roads.
- Construction of tank foundations.
- Tank leakage and spillage during operation.
- Fuel transfer equipment malfunction/failure.
- Construction of the pipeline.

It is anticipated that the capping layer would not be significantly disturbed by the proposal. The tank farm, roadways, building and associated infrastructure would be placed above the capping layer. The foundations for the tanks would be constructed using pile driving techniques.

The earthworks, which include excavations for the stormwater drainage channels and services, represent the greatest possible impacts on the proposed Site. Excavation works for the first flush pit, truck fill stand retention pit and the API separator may penetrate the VENM cap into the soils below. The soils below the VENM cap may contain levels of contamination that would require proper management if found to be contaminated when excavated. Soil sampling and testing would be undertaken where the surface of the paved cap is breached. Any excavated soils found to be contaminated would be managed according to the existing CSMP.

Tank leakage and fuel transfer equipment malfunction or failure can potentially release various fuels into the soils and watercourses. The separation of tanks, the pumping facilities and the truck loading gantry by bunds would act to minimise the spread of, and effectively contain, spill of leaked fuels.

11.3 Environmental Safeguards

Any earthworks to be undertaken on the proposed terminal facility Site are to comply with the existing CSMP. The intersection of the capping layer may potentially intersect historical fill containing VOCs, PAHs or metals. To this extent, Marstel would undertake the following if limited areas of the capping layer are to be removed for site works in accordance with the CSMP:

- Investigate the potential presence of contaminants and assess prior to the commencement of works and demonstrate compliance with applicable legal requirements and the requirements of guidelines, standards or codes adopted or applied by relevant Authorities.
- Identify any required occupational hygiene monitoring for construction personnel in relation to VOCs.
- Any subsurface works would be designed to control and protect the health and safety of people onsite.
- The use of geotextile liners or temporary capping would be used to reduce infiltration of surface water runoff where capping is disturbed during excavation.
- Capping would be reinstated during construction and maintained during operation.

If during the earthworks, including the excavations for the stormwater channels and services, contaminated soils are uncovered they would be separated and managed in accordance with the existing CSMP.

Prior to construction, Marstel would develop an Erosion and Sediment Control Plan (ESCP) to manage sit risks and mitigate potential impacts. This would form part of the CEMP and would be developed in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom 2004) and according to ‘Blue Book’ standards.

11.4 Residual Impacts

The construction and operation of the proposed terminal facility would be undertaken in accordance with the requirements of the CSMP. It is considered that the adherence to these conditions would result in low residual impacts associated with the proposal.

11.5 Conclusions

The Site has been extensively investigated and characterised as part of the overall site for decommissioning and remediation. The existence of the protective capping layer and the nature of the development would reduce the likelihood of contact with any potentially contaminated soils. The implementation of the CSMP requirements would mean that if potentially contaminated soils are encountered they would be managed according to the current CSMP.

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12.0 Noise and Vibration

12.1 Existing Conditions

A noise and vibration impact assessment was prepared by AECOM (2011) to examine the potential impacts of the proposed facility on the acoustic environment.

In order to establish the existing noise environment adjacent to the project area, ambient noise monitoring results presented in two existing noise assessments of the project area have been reviewed. The two assessments were:

- *"Noise Impact Assessment, Marstel Terminals Newcastle, Mayfield (BHP) Site, NSW",* 2008 by Spectrum Acoustics;
- *"Mayfield Site Port-Related Activities Concept Plan EA"*, Revision F, 2009 by Wilkinson Murray.

For this assessment, the more conservative criteria presented in the Spectrum Acoustics 2008 report has been selected to assess noise emissions from the potential construction and operations of the bulk fuel facility.

Spectrum Acoustics included in their report the results of measurements undertaken by Heggies Australia at three locations which were presented in the published environmental assessment for the proposed third coal loader on Kooragang Island (Newcastle Coal Infrastructure Group (NCIG) Coal Export Terminal, Resources Strategies, 2006) where the existing background (L_{A90}) and L_{Aeq} noise levels were measured in accordance with procedures in the *NSW Industrial Noise Policy* (INP).

The existing L_{Aeq} noise level from existing industrial sources also needs to be taken into account when setting noise goals and determining an amenity criterion for a project. The existing L_{Aeq} noise level in adjacent residential areas were presented in the Spectrum Acoustics 2008 report and the results of these measurements are shown below in Table 20.

Table 20 Measured Noise Levels

Location	Noise level descriptor	Measured noise level		
		Day 7am – 6pm	Evening 6pm – 10pm	Night 10pm – 7am
Mayfield	L_{A90}	46	47	43
	L_{Aeq}	63	59	56
	Existing industrial noise L_{Aeq}	54	47	45
Carrington	L_{A90}	42	41	37
	L_{Aeq}	62	67	57
	Existing industrial noise L_{Aeq}	46	45	42



Plate 3 Site Location and Sensitive receiver Locations

12.2 Project Specific Noise Criteria

12.2.1 Construction Noise

Construction activities will take place predominantly during recommended standard working hours (7.00 am – 6.00 pm Monday to Friday and 8.00 am – 1.00 pm Saturday). However, oversized loads and emergency work may need to be conducted outside standard working hours.

Predicted noise levels at nearby sensitive receivers (residential, commercial and industrial premises) are compared to the levels provided in Section 4 of the Interim Construction Noise guidelines (*ICNG)* prepared by OEH. Where an exceedance of the criteria is predicted, the *ICNG* advises that the proponent should apply all feasible and reasonable work practises to minimise the noise impact. Construction noise management levels for the nearest sensitive residential receivers areas are shown in Table 21.

Table 21 Construction noise management levels – Residential receivers

Residential receivers area	Daytime RBL L_{A90} dB(A)	Daytime noise management levels L_{Aeq} dB(A)	Evening RBL L_{A90} dB(A)	Evening noise management levels L_{Aeq} dB(A)	Night-time RBL L_{A90} dB(A)	Night-time noise management limit L_{Aeq} dB(A)
Mayfield	46	61	46[1]	51	43	48
Carrington	42	57	41	46	37	42

Notes:

1. The INP application notes recommend that when higher background noise levels (RBL) occur in the evening assessment period, that the criteria are generally set to the lower daytime criteria in accordance with community expectations.
2. Rating Background level (RBL) values have been adopted from Noise Impact Assessment, Marstel Terminals Newcastle, Mayfield (BHP) Site, NSW", 2008 by Spectrum Acoustics.

Noise management levels for other sensitive land uses around Mayfield, such as schools and places of worship, are shown in Table 5 of Appendix G. However, it is noted that there are no sensitive receivers other than residences in close proximity to the proposed bulk storage site. The closest residential receivers and unattended noise monitoring locations are shown in Plate 3.

12.2.2 Operational Noise

Industrial noise emissions are assessed against the requirements of the *NSW Industrial Noise Policy* (INP). In relation to residential receivers, the INP specifies two noise criteria: an *intrusiveness criterion* which limits Leq noise levels from the industrial source to a value of a 'background plus 5dB' and an *amenity criterion* which aims to protect against excessive noise levels where an area is becoming increasingly developed. The actual project specific noise goals are the lower of the intrusiveness and amenity criteria, in each of the time periods 'day,' 'evening' and 'night.' Both *amenity* and *intrusiveness* criteria are shown in Table 22.

Table 22 Final project specific environmental noise criteria

Receiver area	Period	RBL ($L_{A90, 15\ minute}$)	Intrusive criterion RBL + 5 dB(A)	Ambient ($L_{Aeq, period}$)	Industrial contribution ($L_{Aeq\ 15\ minute}$ dB(A)	Amenity criterion[2]
Mayfield	Day	46	51	63	54	59
	Evening	47[1]	52	59	47	47
	Night	43	48	56	45	37
Carrington	Day	42	47	62	46	60
	Evening	41	46	67	45	48
	Night	37	42	57	42	42

Notes:

1. The OEH's INP application notes recommends that when higher background noise levels (RBL) occur in the evening assessment period, that the criteria are generally set to the lower daytime criteria in accordance with community expectations.
2. The amenity criterion has been based on Mayfield and Carrington receivers being classified as 'urban' receivers. This results in recommended amenity noise criterion of 60 dB(A) during the daytime, 50 dB(A) during the evening and 45 dB(A) during the night. The criterion has then been modified in accordance with the industrial contribution adjustment in Table 2.2 of the OEH INP.

12.2.3 Construction and Operational Vibration

Unlike the criteria applicable to noise emissions, vibration criteria are the same for both the construction and operational phases of this project. OEH's '*Assessing Vibration: a technical guideline*', (DECCW, 2006) has been designed to be used in evaluating and assessing the effects on amenity of vibration emissions from industry,

transportation and machinery. The guideline is used in assessments of vibration impacts caused by the construction and operation of new developments.

Vibration criteria are set primarily according to whether the particular activities of interest are continuous in nature or intermittent, whether they occur during the daytime or night-time and the type of receiver to be assessed e.g. commercial or residential.

The effects of vibration in buildings can be divided into three main categories:

- Those in which the occupants or users of the building are inconvenienced or possibly disturbed, i.e. human disturbance or discomfort;
- Those in which the integrity of the building or the structure itself may be prejudiced; and
- Those where the building contents may be affected.

Therefore, vibration levels at sensitive receiver locations must be controlled so as to prevent discomfort and regenerated noise, and in some extreme cases, structural damage.

The existing nearby industrial developments are located approximately 50 metres from the boundary of the proposed bulk fuel storage site. Those facilities are neither noise nor vibration sensitive. At such distances, the risk of discomfort, regenerated noise and structural damage impacting receivers is extremely low and needs not to be considered further.

For the proposed Marstel Bulk Fuel Facility, the nearest residential receivers (vibration sensitive) are located more than 900 metres from the boundary of the proposed development site. Vibration levels on residential receivers due to additional traffic generated by the proposed development during the construction phase will not be discernable, insignificant against existing background. This is due to the small number of additional heavy vehicles forecast during the project's construction phase. Refer to Section 5.2 of Appendix G for predicted construction traffic numbers. Therefore, from a vibration perspective, no significant impact will arise by the construction of the Marstel Bulk Fuel Facility.

12.3 Predicted Impacts

12.3.1 Construction Noise Impacts

The noise from the construction of the Marstel Bulk Fuel Facility has been predicted at all of the nearest receivers. Predicted noise levels at representative receivers for the proposed construction activities associated with the bulk fuel facility are provided in Table 23. Noise contour maps are attached to Appendix G.

Table 23 Predicted construction noise levels – Residential receivers (refer to Plate 1 for situation)

Receiver[1]	$L_{Aeq(15min)}$ Noise level (external) (dB(A))						
	Predicted (external)[2]	Standard hours		Out of Hours (evening)		Out of Hours (Saturday)	
		Criteria	Exceedance	Criteria	Exceedance	Criteria	Exceedance
R1	31	61	-	51	-	51	-
R2	35	61	-	51	-	51	-
R3	32	61	-	51	-	51	-
R4	35	61	-	51	-	51	-
R5	26	57	-	46	-	47	-
R6	34	70	-	70	-	70	-
R7	34	61	-	51	-	51	-
R8	34	61	-	51	-	51	-
R9	31	55[3]	-	N/A[4]	-	N/A[4]	-
R10	59	75	-	75	-	75	-

Notes:

1. All the representative sensitive receiver locations are presented in Table 1 of Appendix G.
2. Predicted noise levels have been assessed against neutral meteorological conditions.
3. In the OEH ICNG school classroom criteria is an internal noise level, with a recommended internal noise level of 45 dB(A). A 10 dB reduction has been assumed between external and internal noise levels based upon a window being open for adequate natural ventilation.
4. Schools are required to be assessed during school hours only.

Construction activities are not predicted to exceed the recommended construction NMLs at all nearby sensitive receiver locations. There are no other proposed construction activities at other nearby sites that are currently known. As a result, there will not be any additional increase in the predicted noise impacts from construction activities on nearby noise sensitive receiver locations.

12.3.2 Operational Noise Impacts

Results of environmental noise emissions from the bulk fuel terminal at nearby representative receiver locations were generated during normal operations and for extreme conditions that may cause noise increases (such as temperature inversion or strong prevailing wind conditions). The predicted noise levels are presented in Table 24 and the noise contour maps are presented in Appendix G.

Table 24 Noise contribution at representative receiver locations during night-time operational conditions – Amenity criteria

Receiver	Criterion	Neutral		Temperature inversion (Class F, 3˚C/100m)		Worst case wind (North-west wind, 3m/s)	
		Result	Exceed	Result	Exceed	Result	Exceed
R1	37	24	-	29	-	22	-
R2	37	29	-	33	-	29	-
R3	37	27	-	32	-	24	-
R4	37	29	-	33	-	29	-
R5	42	19	-	23	-	24	-
R6	65	29	-	33	-	30	-
R7	37	27	-	32	-	23	-
R8	37	27	-	32	-	23	-
R9[2]	45	23	-	28	-	22	-
R10	70	43	-	45	-	41	-

Notes:

1. In the OEH INP the school classroom criteria is an internal noise level, with an acceptable noise level of 35 dB(A) and a recommended maximum of 40 dB(A). A 10 dB reduction has been assumed between external and internal noise levels based upon a window being open for adequate natural ventilation.
2. The noise impacts on schools are to be assessed during school hours. As there is not a significant variation in noise levels between the day and night operations, the predicted night time noise levels at the school have been assessed against the school criteria to determine the noise impact.

Table 25 Noise contribution at representative receiver locations during night-time operational conditions – Intrusiveness criteria

Receiver	Criterion	Neutral		Temperature inversion (Class F, 3˚C/100m)		Worst case wind (North-west wind, 3m/s)	
		Result	Exceed	Result	Exceed	Result	Exceed
R1	48	25	-	30	-	30	-
R2	48	30	-	34	-	34	-
R3	48	28	-	32	-	32	-
R4	48	30	-	34	-	34	-
R5	42	19	-	24	-	24	-
R6	-	30	-	34	-	34	-
R7	48	28	-	33	-	33	-
R8	48	28	-	32	-	32	-
R9[2]	45	24	-	29	-	29	-
R10	-	48	-	49	-	49	-

Notes:

1. In the OEH INP the school classroom criteria is an internal noise level, with an acceptable noise level of 35 dB(A) and a recommended maximum of 40 dB(A). A 10 dB reduction has been assumed between external and internal noise levels based upon a window being open for adequate natural ventilation.
2. The noise impacts on schools are to be assessed during school hours. As there is not a significant variation in noise levels between the day and night operations, the predicted night time noise levels at the school have been assessed against the school criteria to determine the noise impact.

No exceedance of the Noise Management Levels (NML) is predicted to occur during day or night for both amenity and intrusiveness criteria.

12.3.3 Sleep Disturbance Criteria

The night time sleep disturbance assessment has been undertaken against the most stringent meteorological condition, which for all receiver locations is the Class F temperature inversion scenario (refer to Appendix G for description of meteorological Classes). The sleep disturbance criteria assumes there will be a truck and forklift operating at the bulk fuels facility, and a crane and noise from the ships power unit generated at Berth 4. The results are presented in Table 26. Noise contour maps are provided in Appendix G.

The 900 m separation between the site and the nearest residential receivers means that the maximum external noise levels are not predicted to exceed 49 dB(A) due to the night-time operations of the bulk fuel facility. Therefore, the assessment indicates compliance at all assessment locations during the night-time period.

Table 26 Noise contribution at representative sensitive receiver locations during night time operational conditions

Receiver	Criterion	Predicted $L_{A1\ (1\ minute)}$ with temperature inversion (Class F, 3˚C/100m)			
		Result – Operations excluding reversing alarms	Exceed	Result – Reversing alarms	Exceed
R1	58	40	-	44	-
R2	58	45	-	48	-
R3	58	43	-	46	-
R4	58	43	-	48	-

Receiver	Criterion	Predicted $L_{A1\ (1\ minute)}$ with temperature inversion (Class F, 3˚C/100m)			
		Result – Operations excluding reversing alarms	Exceed	Result – Reversing alarms	Exceed
R5	52	31	-	35	-
R6	-[1]	41	-	47	-
R7	58	46	-	49	-
R8	58	46	-	49	-
R9	-[1]	45	-	40	-
R10	-[1]	74	-	65	-

Notes:

1. Only residential receivers have been assessed for sleep disturbance.

12.3.4 Road Traffic Noise

Existing traffic flows for the local road network were determined from the most recent published RTA permanent count station data for Station No. 05.953, located Mayfield West, west of Woodstock Street which is located 1.4km to the west of the location of the access road at the intersection of Industrial Drive and Ingall Street. It is proposed that the site will generate 56 movements per day in its first year of operation, which is the scope of operations currently proposed for assessment and approval. It is anticipated that after a possible future modification to that project approval, an expanded scope of operations at the site, would generate 108 traffic movements per day. It has been concluded that if the proposed development were to go ahead, traffic on surrounding roads would be altered in 2012 and by 2016 as detailed in Table 27.

Table 27 Summary of traffic flow increase

Location	Year	Existing	Nett increase	% Increase	Increase in noise levels, dB(A)
Industrial drive, Mayfield Station No. 05.953	2012	30717	56	0.2	<0.1
	2016		108	0.4	<0.1

Notes:

1. Traffic Numbers are based upon the Traffic Volume Data for Hunter and Northern Regions 2004, produced by the Roads and Traffic Authority.
2. This is the worst case scenario where all traffic movements from the site head in the same direction from the site along Industrial Drive, Mayfield, and this is based upon the lowest annual average traffic flow numbers on Industrial Drive in proximity of the site.

Predicted traffic noise increases on road surrounding the proposed development are less than 0.1 dB(A) based upon the estimated 56 vehicle movements per day. The existing traffic noise levels were presented in the Spectrum Report No.07314 dated September 2008. Even though the existing traffic noise levels exceed the recommended traffic noise criteria in accordance with the OEH RNP, the increase in traffic noise as a result of traffic from the project site would not have a noticeable impact on sensitive receivers adjacent to Industrial Drive, Mayfield, and it would not be reasonable or feasible to provide noise mitigation measures as the worst case traffic noise increase from the project site would not be noticeable to nearby receiver locations.

12.4 Conclusion

The Noise and Vibration Impact Assessment for the Marstel Bulk Fuels Facility made the following conclusions in relation to development phases and noise criteria.

12.4.1 Construction noise and vibration

Noise producing construction activities with typical associated equipment have been modelled at the project site to give an indication of the noise at the nearest residential and commercial receivers. The construction noise and

vibration assessment was conducted in accordance with NSW Office of Environment and Heritage (OEH) '*Interim Construction Noise Guidelines' (ICNG, 2009)*.

The construction noise assessment indicates compliance with OEH's ICNG acoustic requirements at all assessment locations during the daytime (i.e. during OEH's standard construction hours).

The construction vibration assessment indicates that, due to the large buffer distance between the project site and nearby residential receivers, the risk of discomfort, regenerated noise and structural damage impacting on receivers is extremely low.

12.4.2 Operational noise and vibration

The operational environmental noise emission criteria for the development have been quantified in Section 4.0 of Appendix G and have been established to comply with the NSW OEH's Industrial Noise Policy (INP, 2000).

The operational noise impact assessment indicates compliance under neutral and prevailing meteorological conditions at all assessment locations during the daytime, evening and night-time periods. This outcome is predicted, conditional that the equipment installed produce noise levels equivalent to or less than those shown in Section 6.0 or Appendix G.

No items of plant and equipment used in operation of the project site are expected to generate significant levels of vibration and therefore, operational vibration impacts are consequently expected to be negligible.

12.4.3 Sleep disturbance

The sleep disturbance assessment was conducted in accordance with NSW OEH's INP guidelines. The assessment indicates compliance at all assessment locations during the night-time period.

12.4.4 Cumulative noise impacts

An assessment of the cumulative impact of concurrent construction noise and vibration activities was undertaken. As there are no other known large scale construction activities planned to occur concurrently with the proposed construction works there will not be any additional increase in the predicted noise impacts from construction activities on nearby noise sensitive receiver locations.

An assessment of the cumulative operational noise and vibration impacts from other industrial sites nearby to the project site in addition to the project site was undertaken to determine the total noise exposure of nearby receivers. The assessment found that, based upon the predicted noise levels the Bulk Fuel Facility, noise emissions are predicted to not increase the existing and approved noise levels at nearby receiver locations.

12.4.5 Road traffic noise

The construction and operational road traffic noise assessment was conducted in accordance with NSW OEH's Road Noise Policy (RNP, 2011) guideline.

The road traffic noise assessment associated with construction and operational phases of the Bulk Fuel Facility indicates compliance with OEH RNP acoustic criteria.

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G:\Projects\602 Projects\60212465 Marstel Terminal REF\FIGURES\60212465 F8 Noise Monitoring Locations 01 11 2011 TO

AECOM

NOISE MONITORING LOCATIONS

Environmental Assessment
Port of Newcastle, New South Wales

FIGURE 8

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13.0 Traffic and Transport

A traffic assessment of the proposed bulk fuel terminal was prepared by AECOM in 2010 as part of the Mayfield Concept Approval Submission. It assessed the existing traffic conditions on the road network and predicted impacts from the proposal (Appendix D). Intersection performance assessments were evaluated using SIDRA Intersection 3.2, a computer based modelling package designed for calculating isolated intersection performance.

13.1 Existing Conditions

The Site of the proposed terminal facility is located within the overall Mayfield Concept Approval Site, to the east of the existing OneSteel development on Steelworks Road off Ingall Street and Industrial Drive, on vacant land previously occupied by BHP Steel Works (refer Figure 9).

The overall Mayfield Concept Approval Site is serviced by two primary road access points. These are the intersections of Ingall Street and George Street with Industrial Drive as shown on Figure 9. Under the proposed Concept Plan layout the most direct and therefore main access to the Bulk Fuels Facility will be the main access into the Estate at the traffic signal controlled intersection of Industrial Drive and Ingall Street. The traffic route is shown in Figure 5, and in the Transport Assessment Report at Appendix D. Under a deed of agreement between NPC and Marstel, NPC would provide Marstel with legal access to the Facility.

During the operational phase of the Facility, NPC would provide Marstel and its contractors with access to the Site with a permanent road and services access from Ingall Street, along Steelworks Road and down the eastern side of the Facility (refer Figure 5).

It is anticipated that NPC would provide access to the Site via Selwyn Street during the construction phase of the Facility. This access would run from Selwyn Street, across the Mayfield concept approval site to Mayfield Berth 4, and along the Koppers pipeline easement to the proposed Facility (refer Figure 4).This method of access is proposed for the construction phase, however it may also be used during the early operational stage of the Facility, if the proposed operational access route is not completed.

The terms of the agreement between Marstel and NPC require NPC to seek and obtain approval to construct the Ingall Street access road, and associated intersections and access ways.

There is a Security Gate located on the access road approximately 220m north of the intersection of Industrial Drive with Ingall Street. All the roads north of the Security Gate are privately owned and require easement rights for use as accesses.

OneSteel still occupies the bulk of the land in the area with its Pipe and Tube, and Wire Works. Other land uses in the area to the east of Industrial Drive include Koppers (Australia), ICI Australia, and Donhad, which do not use the Ingall Street access. There is also a Technical Training Centre on the northeast corner of Ingall Street and Steelworks Road, and a Storage World on the northwest corner of the intersection of Industrial Drive and Ingall Street.

It is anticipated that NPC would be seeking approval as part of a separate project application to construct an internal link road connecting all precincts in the Mayfield Concept Approval Site. This would allow traffic generated to also access and egress the site via the Industrial Drive / George Street Intersection. The layout and proposed intersections are to be confirmed along with the Intertrade Site proponent (Buildev). It is anticipated that this would be undertaken in consultation with all precinct operators, the RTA and NCC.

13.2 Predicted Impacts

13.2.1 Construction Traffic Impacts

The construction period for the proposal is expected to take some 14 months which would include site establishment, subsurface and surface preparation, transport and establishment of fuel storage tanks and associated infrastructure. The nature and intensity of activities affecting the road network would involve staff/contractor movements, and the delivery of plant and equipment to Site, although delivery to the Site would be kept to a minimum as much of the material would be prefabricated offsite and delivered to the Site for installation and commissioning. In general, activities that would potentially generate traffic may include:

- Trucks of various sizes for the delivery of plant and equipment, ranging in sizes up to semi trailers.
- Concrete trucks and pumps associated with the construction of the tank footings and bund wall.

- Construction traffic along the pipeline route (no impact to public roads).
- Light vehicles associated with construction personnel.

The construction phase would require construction staff ranging from ten people and peaking for a short period at approximately 50 people.

Construction traffic trips would be spread rather than being concentrated on a short peak arrival/departure. At the peak staff/visitor demand level during operation, the peak hour traffic increase is not expected to exceed ten trips and is not likely to have an adverse impact on the road network.

The existing access at Selwyn Street would be used during the construction phase as the formal connection of the Mayfield Concept Plan area and Ingall Street will be undertaken as part of Stage 1 of the Intertrade Industrial Park. During the operational phase of the Facility, NPC would provide Marstel and its contractors with access to the Site with a permanent road and services access from Ingall Street (refer Figure 5). This would be the only access once the fuel terminal facility is fully operational.

As Marstel intend on beginning construction in 2012, pending approval, and as there are no project approvals for the Mayfield Concept Plan site, there are not expected to be any cumulative impacts from construction traffic.

13.2.2 Operational Traffic Impacts

Traffic Generation

The RTA *Guide to Traffic Generating Developments* suggests traffic generating rates for a range of land use activities. The proposed operation for the Proposed Project is not reflected in the standard rates contained in the RTA Guide. Table 27 sets out the rates adopted for this Project (as provided by Marstel) for the proposed operations. This is based on the assumption that hours for site operation are to be 24 hours a day, 365 days per year. Assumed traffic generation is considered accurate based on activities at similar facilities owned and operated by Marstel, as well as the capacity of the site to services the number of tankers proposed.

Table 28 Potential Traffic Generation

Use – Bulk Fuel Storage Facility	Adopted Rates - Weekdays	Adopted Rates – Weekend Days (Saturday)
Road Delivery Trips	18 tankers accessing the site (36 trips)	16 tankers accessing the site (32 trips)
Staff/Visitor Trips	10 light vehicles accessing the site per weekday (20 trips)	5 light vehicles accessing the site per Saturday (10 trips)
Project Trip Total	Daily 56 trips	Daily 42 trips

Concentration of tanker trips in peak hours is expected to be limited. As there are a limited number of truck filling bays at the facility, the arrival of trucks during a given day will be staggered to take advantage of the truck filling stations as they become available causing an even spread of truck movement throughout the day.

Intersection Performance

Operations are to be in accordance with the approval conditions issued in response to the Mayfield Concept Approval Submission. As an approval is yet to be issued for the Concept Plan, the recommendations and commitments made in the Concept Plan are assumed to be incorporated into the approval. The Traffic Impact Assessment (TIA) prepared for the Mayfield Concept Approval Submission (AECOM 2010) (Appendix D) predicted a total of 56 tankers per day from the bulk liquid precinct based on a throughput of 1,010 ML per year.

As detailed above, the proposed facility seeks approval for capacity of 600ML and will generate 18 tankers per day. Regardless of this difference, this existing modelling based on 56 tankers a day will be used to provide a conservative assessment.

Typically tankers would travel via Industrial Drive to/from the Pacific and New England Highways and F3 corridors, as it is anticipated the majority of customers would be in the Hunter Valley coal fields and industrial areas. The traffic would converge from and disperse to the broad road network at either the George Street or Ingall Street intersections with Industrial Drive. The distribution for all destinations would be via Industrial Drive.

Intersection (SIDRA) analysis was previously undertaken for the Mayfield Port Concept Plan to determine the impacts of the various components of the Concept Plan area. As mentioned above the Mayfield Concept Plan TIA

assumed a daily vehicle trip generation of 56 trucks per day providing a conservative measure when compared to the facility now proposed.

For the purposes of this assessment the Concept Plan modelling for the year 2024 has been used, as opposed to the 2034 modelling. This is based on the fact that:

- The proposed facility would be at full the capacity sought by this approval after construction in late 2012 (subsequent approvals would assess any related increase in traffic).
- The model assumes all aspects of the Concept Plan will become operational prior to 2024 and therefore assesses all cumulative impacts.
- Interim modelling and management of traffic committed to under the Concept Plan would see any traffic management issues, monitored, identified and addressed as they arise meaning conditions are likely to change from those used in the 2034 modelling. Furthermore, it is likely that other elements of the Concept Plan and/or the Intertrade Industrial Park will trigger changes to traffic management in the future.
- 2034 modelling makes a number of assumptions about the local road network and annual traffic increases which maybe not be accurate out to 2034. As a rule modelling/forecasting past a ten year horizon (in this case 20+ years) provides less certainly in outcomes.

The Concept Plan TIA concluded that the 2024 Levels of Service (LOS) at the Industrial Drive / Ingall St and Industrial Drive / George St intersections would achieve the LOS shown in Tables 14-17 under the following morning and evening peak scenarios, assuming full development of the Concept Plan area. Further discussion on these results is provided below.

Industrial Drive / George Street

Table 29 AM Peak intersection Performance Industrial Drive / George Street

Location	Demand Flow (veh/h)	Level of Service[1]	Deg of Satn[2] (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Industrial Drive (S Leg)	926	B	0.533	18.9	105
George St (E)	49	C	0.054	30.6	9
Industrial Drive (N Leg)	1,441	B	0.823	25.5	198
George St (W)	91	C	0.149	34.5	18
All Vehicles	**2,507**	**B**	**0.823**	**23.5**	**198**

Table 30 PM Peak intersection Performance Industrial Drive / George Street

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95%Bacvk of Queue (m)
Industrial Drive (S Leg)	1,310	C	0848	30.6	202
George St (E)	79	C	0.140	33.7	17
Industrial Drive (N Leg)	1,174	B	0.750	23.3	154
George St (W)	56	C	0.071	31.4	10
All Vehicles	**2,619**	**B**	**0.851**	**27.4**	**201**

[1] Refer to Traffic impact Assessment for definition of Levels of Service (LOS)
[2] Deg of Satn = Degree of Saturation.

Industrial Drive / Ingall Street

Table 31 AM Peak intersection Performance Industrial Drive / Ingall Street

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95%Bacvk of Queue (m)
Ingall St (S Leg)	171	D	0.428	43.3	47
Industrial Drive (E Leg)	1,258	B	0.764	23.6	156
Ingall St (N Leg)	145	D	0.830	49.1	58
Industrial Drive (W Leg)	2,004	B	0.841	25.3	268
All Vehicles	**3,578**	**B**	**0.841**	**26.6**	**268**

Table 32 PM Peak intersection Performance Industrial Drive / Ingall Street

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95%Bacvk of Queue (m)
Ingall St (S Leg)	183	C	0.419	36.7	59
Industrial Drive (E Leg)	1,699	F	1.085	213.9	785
Ingall St (N Leg)	303	F	1.076	159.1	221
Industrial Drive (W Leg)	1,472	C	1.000	42.4	213
All Vehicles	**3,657**	**F**	**1.085**	**131.5**	**785p**

As is shown above, the George Street Intersection with industrial Drive will maintain an acceptable LOS B while the Industrial Drive / Ingall Street intersection would experience an LOS of F, assuming no internal link road to manage traffic distribution between the intersections. With this outcome the Concept Plan EA SoC provides that a link road would be provided within the Concept Plan area *for distributing traffic between the Industrial Drive/Ingall Street intersections* (AECOM, 2010).

The Concept Plan EA undertook additional modelling of the Industrial Drive / Ingall Street intersection under the link road scenario allowing traffic from the various precincts of the Concept Plan site to be distributed between the two intersections, whilst maintaining an LOS at the Industrial Drive / George Street Intersection which meets the required criteria, i.e. utilising the spare capacity in the Industrial Drive / George Street intersection. The results of this modelling for AM and PM peak loading are shown in the following Tables.

Table 33 AM Peak Intersection Performance Industrial Drive / Ingall Street – with internal link road

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95%Bacvk of Queue (m)
Ingall St (S Leg)	171	D	0.600	48.3	51
Industrial Drive (E Leg)	1,244	B	0.657	21.4	150
Ingall St (N Leg)	115	D	0.738	44.9	37
Industrial Drive (W Leg)	1,949	B	0.740	17.0	196
All Vehicles	**3,479**	**B**	**0.745**	**21.0**	**196**

Table 34 PM Peak Intersection Performance Industrial Drive / Ingall Street– with internal link road

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95%Bacvk of Queue (m)
Ingall St (S Leg)	183	D	0.800	54.5	74
Industrial Drive (E Leg)	1,691	B	0.854	26.5	264
Ingall St (N Leg)	244	B	0.542	28.3	46
Industrial Drive (W Leg)	1,440	B	0.839	23.1	145
All Vehicles	**3,558**	**B**	**0.854**	**26.7**	**264**

The results show that by utilising the space capacity at the Industrial Drive / George Street Intersection, the Industrial Drive /Ingall St Intersection can achieve a LOS B, meeting the criteria initiated by the Concept Plan. Notably the link road is designed primarily to address traffic generation from the container terminal (the primary traffic source within the Concept Plan area) when operational. By comparison traffic generated by the Bulk Liquids Facility would equate to a much smaller proportion (approx 6%) of overall site traffic from the Concept Plan area.

Furthermore the Concept Plan commits to (and would be conditioned upon approval) monitor traffic impacts at these intersections during the development of the Concept Plan area. Specifically Section 11.3.3 of the Concept Plan EA makes the following commitments to:

- *Conduct periodic assessment of operation of the internal and external intersections and roadways, and*
- *Periodically review the trip generation and distribution to reflect actual site conditions, taking into account any cumulative traffic impacts associated with the future IIP. This would be of particular importance where a precinct generates traffic levels below those documented because it may allow other precincts to generate higher traffic levels while still complying with the overall site criteria.*

Such monitoring would enable traffic infrastructure upgrade needs to be identified ahead of time.

In demonstrating that traffic generated by the Bulk Liquids Fuel Facility can be adequately managed when considered in unison with the Concept Plan, it is evident that the facility can operate in isolation (no other elements of the Concept Plan operating) without triggering and intersection upgrades or exceeding LOS criteria for the Industrial Drive George St / Ingall St Intersections.

Internal Access and Parking Criteria

A project summation of key site elements, along with applicable standards and compliance is provided in Table 35.

Table 35 Parking and Access Assessment

Criteria	Clause	Assessment or Requirement	Provided	Complies
Classification of Use	(AS) Table 1.1	Class 1	NA	NA
Road Frontage type	(AS) Table 3.1	Local	NA	NA
Number of Parking spaces	(AS) Table 3.1	<25 range	8	Yes
Parking Bays	(AS) Figure 2.2	90 Degree, 5.4m x 2.6m	5.5m x 2.6m	Yes
Parking Aisle	(AS) Figure 2.2	Staff Car Park – 6.2m	6.6m	Yes
Driveway Category	(AS) Table 3.1 (AS2) Figure 3	Category 1 AV	NA NA	NA NA

Criteria	Clause	Assessment or Requirement	Provided	Complies
Driveway Design	(AS) Table 3.2 (AS2) Figure 3.1	3.0 to 5.0m combined 12.5m wide at kerb	Car Park 6.6m comb Trucks flow One Way	Yes Yes
Driveway location	(AS) Clause 3.2.3	Figure 3.1	Not at an intersection	NA
Sight distances		65m	Unlimited to the south and north	Yes

The proposed facility would generate little demand for parking as staff levels are low. Periodic ship berthing may lead to minor and short-lived increases in parking demand while the ship is at berth. Usage of the eight proposed parking spaces would be maximised during these times. In the event that high demand for parking spaces arises there would be capacity for on-street parking to be utilised. As peak parking demands would be infrequent it is considered that the proposed eight parking spaces are adequate for the normal demands of the site and the prevailing road environment.

Staff parking is proposed in the designated area shown on Figure 6 which allows separation of truck and light vehicle traffic. The parking area would be able to be secured through the use of a lockable security gate. The proposed parking location also provides safe pedestrian access to the site office.

13.3 Environmental Safeguards

The erosion and sediment control plan would incorporate techniques for construction of access roads into the Site. Dust and sediment controls would be included to reduce impact, especially during the construction period.

Operationally trucks will be held within the designated truck fill area which incorporates spill collection pits to prevent the spillage and tracking of hydrocarbons onto the local road network from either the trucks themselves, or the fuels they will carry.

As discussed above traffic generated by the development has also been assessed as part of the Mayfield Concept Approval Submission. Impacts relating to noise and air emissions were assessed to be acceptable safeguards to be implemented.

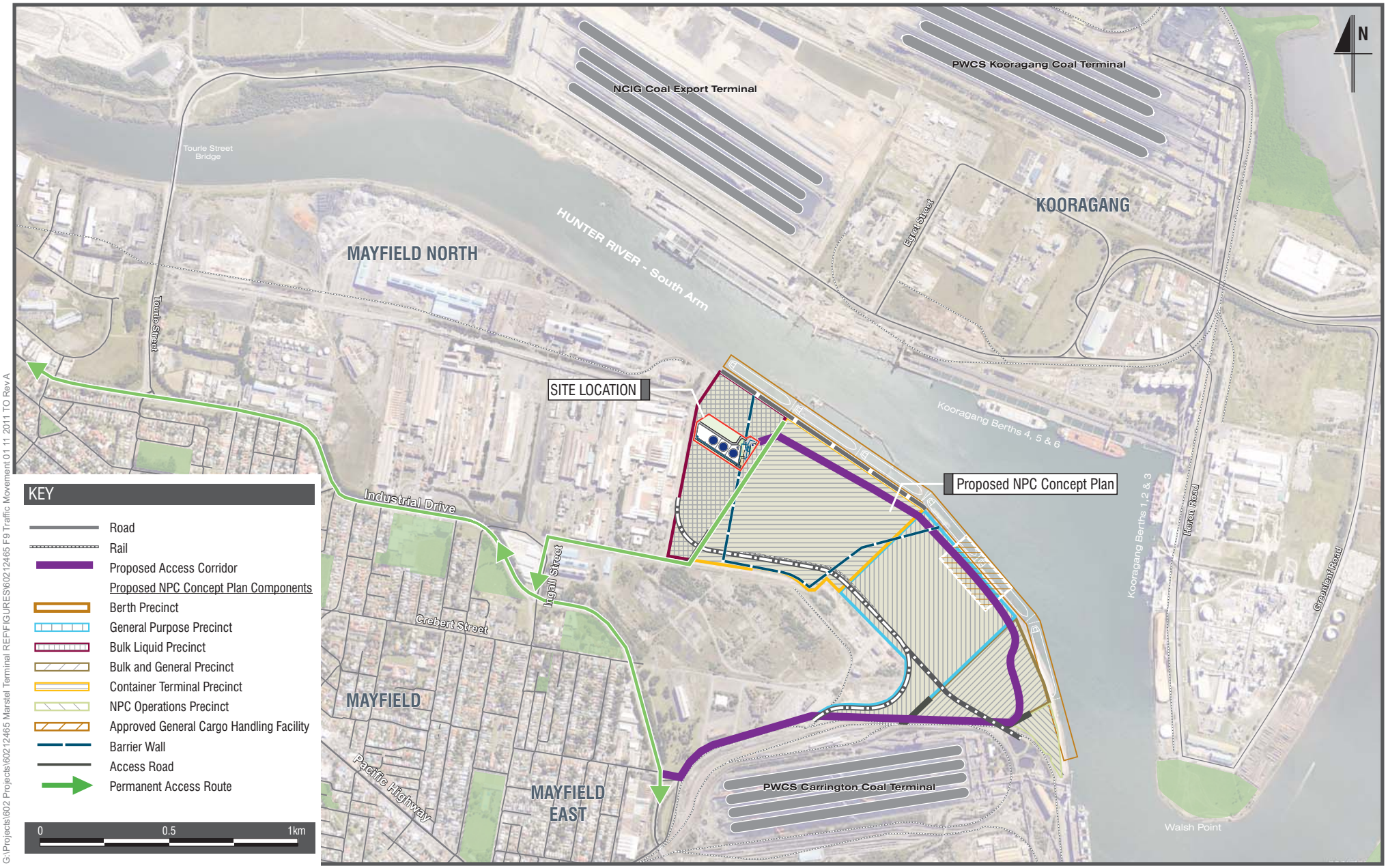
13.4 Residual Impacts

The traffic and car parking impacts as a result of the proposed facility comply with all relevant guidelines and standards. Upon consideration of the number of vehicle movements each day and the current road configuration, it is concluded that the proposal would have a low residual impact to the local road network and other users.

13.5 Conclusions

The traffic generated from the Facility has previously been assessed as part of the Mayfield Concept Approval Submission. The assessment concluded that the cumulative impact of the entire Concept Plan area (the proposed facility included) will allow the George and Ingall Street Intersections to operate within the relevant criteria out to a 2024 scenario provided appropriate strategies are implemented. Importantly the appropriate distribution of traffic from the Concept Plan area must be appropriately distributed between the two intersections. It is anticipated that this requirement will be conditioned to the Concept Plan when approved and form a key management practise as part of a site wide Traffic Management Plan.

The proposed security gate entry and Industrial Drive intersection would provide adequate geometric layouts, as part of their existing design to cater for heavy vehicles.



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AECOM

TRAFFIC MOVEMENT

Environmental Assessment
Port of Newcastle, New South Wales

FIGURE 9

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14.0 Visual

14.1 Existing Conditions

A visual impact assessment was prepared for the proposed bulk fuel storage facility. The assessment describes the existing environment where the facility would be located; the visual change likely to result from the facility; and makes recommendations to mitigate potential adverse impact. The visual impact assessment is included as Appendix B.

The former BHP Steelworks area has been cleared to remove infrastructure related to the former plant, and to make the Site suitable for future industrial activities. Currently there are no internal roads within the Steelworks area. Internal roads are proposed to be constructed to enable direct vehicular access to lots, including the proposed facility.

The industrial area is not readily accessible, physically or visually. The Steelworks area is on low-lying land adjacent the Hunter River. There are few vantage points that overlook the Site. The closest viewing locations to the Site would be from existing industrial lots to the west and south-east of the Site, and from industrial lots within Kooragang Island's industrial area to the north. In the future, there would also be industrial sites immediately north, east and south of the Site within the Steelworks industrial area that may view the Site. These neighbouring industrial lots are similarly low-lying as the proposal Site.

Along Industrial Drive, land is more elevated; however, views of the Site are largely obstructed owing to topography, buildings and intermittent vegetation. There are few residential areas from which views to the Site are possible. The closest area is Crebert Street, Mayfield. Views across the former Steelworks industrial area are only possible from the eastern section of this street.

Passing views of the Site would also be possible from the Hunter River, from recreational users and tourists.

14.2 Predicted Impacts

The industrial area is not readily accessible, physically or visually. The few locations from which the Site can be viewed are:

- Industrial Drive
- Cormorant Road, Kooragang Island
- Mayfield residential area (Crebert Street)
- The Hunter River
- The surrounding industrial area.

14.2.1 Industrial Drive

Industrial Drive is elevated above the lower lying industrial area along the Hunter River. From the road, intermittent views into the riverside industrial area are possible. However, the former Steelworks Site is largely obstructed from view by existing trees and shrubs which line the road and screen views to the north. Drivers and passengers along Industrial Drive would only capture minimal glimpses of the Site. Pedestrians may have a greater opportunity to view the facility; however the views would be of structures which are compatible and fit well with the surrounding industrial context.

14.2.2 Cormorant Road, Kooragang Island

Views of the Site are also available from Cormorant Road, which is north of the Site across the Hunter River. The height of existing buildings in the background of the proposal Site would help the facility integrate with surrounding industrial infrastructure when viewed from Cormorant Road. Future industrial development both adjacent to the proposal and on the northern bank of the Hunter River may potentially obstruct views in the future.

14.2.3 Mayfield Residential

Residential areas are the most sensitive to visual changes. There are few residential areas from which views to the Hunter River industrial area are possible. Only the eastern extent of Crebert Street, Mayfield, has viewing access into the former Steelworks area. This view is similar to other industrial views currently experienced by residents at the eastern end of Crebert Street.

14.2.4 Hunter River

Transitory views toward the proposal Site would be possible from the Hunter River. The river is used by recreational users and tourists for fishing and boating, and by those who work in the port and on ships. There are also tourist/entertainment boats cruising the river which may travel near the proposed Site.

Although people using the Hunter River can travel in close proximity to the proposed Site, and may see some, or all of the proposed development, views are transitory. The proposal Site is part of an industrial area and, in this part of the river, the industrial landscape forms the visual backdrop to the river's boating and entertainment activities. The proposed Site would not be a focal point, but comprise part of the industrial scene afforded to users of the river.

14.2.5 Surrounding Industrial

The closest viewing locations to the Site are from neighbouring industrial sites (existing and proposed) within the existing industrial area, east and west of the Site. The proposal Site is also seen from industrial lots on Kooragang Island's industrial area.

Neighbouring industrial users are not considered to be sensitive to the proposal's visual impact. Existing and proposed industrial residents form part of the industrial landscape of the area.

14.3 Environmental Safeguards

The visual impact assessment has identified that the proposal would have minimal impact to the visual amenity of residents, neighbouring industry or transient visitors. Soft landscaping options can be adopted to mitigate localised viewshed effects, where they do not impacts safety and security.

14.4 Residential Impacts

The visual assessment undertaken for the proposed terminal facility has identified that due to the lack of access to the site, the lack of any significant view corridor and the industrial context of the wider area, the potential impacts would be minimal. The residual impacts are considered negligible.

14.5 Conclusions

The visual impact assessment prepared for the terminal facility concluded the potential impact to nearby residents, industries and transient visitors was minimal. The Site is well shielded from the residential areas of Mayfield due to existing planting and the prevailing topography. The terminal facility is also consistent with the existing industrial land use surrounding the Site.

15.0 Waste Management

The appropriate management of waste has been identified as a key issue, for both the construction and operational phases of the proposal. This section identifies the various waste streams that would be generated by the facility during both construction and operation. The handling and final disposal of these wastes has been determined based on regulatory guidelines and industry best practice.

15.1 Predicted Impacts

15.1.1 Construction

Wastes that would be generated during the construction of the facility would be primarily associated with materials used in the packaging of plant and equipment to the Site. The sources of waste and likely quantities are provided in Table 36.

Table 36 Construction Waste

Source	Estimated Quantity (tonnes)
Vegetation and weed removal	0.5
Surplus construction waste such as: - Scrap metal - Asphalt - Timber formwork - Spent Erosion and Sediment control materials - Fencing - Soil. **Approx Total**	 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1 **<100**
Wastes from toilets and bathrooms.	50[1]
Office waste such as paper, ink cartridges, toner and cardboard.	15.6
Domestic waste from construction personnel including putrescibles and recyclable wastes.	15.6
Packaging Waste including: - Plastics - Timber pallets - Metal wires - Cardboard.	312

Note:

1. Projected waste water quantity is based on NSW Department of Health's general allowance of 200L of water per person per day

15.1.2 Operation

The Site would not generate a significant amount of waste as a consequence of its operation. The Site would generally have only two operators onsite, with the exception of ship unloading events. Waste streams that would be generated as part of the operation of the Site are indicated in Table 37.

Table 37 Operation Waste Streams

Stream	Classification	Estimated Quantities (tonnes/annum)
Oily water within retention pits	Liquid	Depend on rain events and water quality criteria. Storage provided for 50 m^3 from gantry and 50 m^3 from roadways
Sludge from stormwater retention pits	Solid	~ 1 tonne p.a.
Absorbents used to clean small spills	Industrial	Dependent on number of clean-up events undertaken
Ablutions waste	Solid/liquid	1.3

Stream	Classification	Estimated Quantities (tonnes/annum)
Domestic and putrescibles waste	Inert Waste	< 1 per quarter
Vegetation from landscaping maintenance	Inert Waste	< 1 per quarter

15.2 Environmental Safeguards

15.2.1 Waste Strategies

The waste strategies for the proposal have been developed in accordance with the principles of the *Waste Avoidance and Resource Recovery Act 2001*, which includes:

- Efficient use of resources
- Ensuring that resource management options are considered against a hierarchy of the following order:
    - Avoidance of unnecessary resource consumption
    - Resource recovery (including reuse, reprocessing, recycling and energy recovery)
    - Disposal.

Efforts in waste reduction and recycling would also be implemented in accordance with the Waste Avoidance and Resource Recovery Strategy 2007 and the SEPP (Infrastructure). Marstel is committed to operating the facility within these principles. Waste management strategies to be adopted on the Site are discussed in the following sections.

15.2.2 Avoidance

The generation of wastes from the Site would be avoided through the adoption of reasonable purchasing procedures. This is to ensure that products purchased for the Site would align with site demands and avoid wastage of unwanted products. This would be imperative particularly during the construction phase, with the need for close alignment with procurement and construction specifications.

15.2.3 Reuse

Where feasible, materials would be reused onsite. However, due to the limited waste streams generated onsite, reuse options may be limited.

15.2.4 Recycling

Paper, cardboard, glass and plastics would be available for recycling. A bin would be placed adjacent to the office which would be collected by a waste management contractor on a regular basis.

15.2.5 Disposal

Disposal of wastes would be minimised where possible. Putrescibles wastes from the office would be sent to landfill, with other wastes generally diverted for recycling.

Effluent from the facility would be treated via an onsite septic system. This would be sufficient to manage demands from the peak number of employees during operation.

15.3 Residual Impacts

With the implementation of the waste strategies as discussed above, it is predicted that there would not be significant residual impacts associated with wastes generated from the site. Disposal of materials would be undertaken by a licensed contractor and Marstel would ensure appropriate final disposal is undertaken.

15.4 Conclusion

The low generation of waste associated with the operation of the facility, together with the identified safeguards, are not expected to result in significant impacts associated with the proposal.

16.0 Ecology

16.1 Existing Conditions

The Site of the proposed Facility is located on vacant land with established industries adjoining to the east, west as well as across the Hunter River to the north on Kooragang Island. The topography is largely flat and the Site lies at an elevation of approximately 1.9 m AHD. The northern section of the Site is adjacent to the South Arm of the Hunter River. Surrounding land uses include port related activities, industrial uses and residential and commercial areas. The proposed Facility would be located on part of the former BHP Steelworks Site, where the environment has been highly modified. Since 2011 the Site has undergone extensive remediation. The Site has been cleared of all vegetation, filled, and covered with a capping layer to stabilise contaminated soils.

16.2 Flora and Fauna

Searches of the National Parks and Wildlife Service (NPWS) *Atlas of NSW Wildlife* and the EPBC Act *Protected Matters Search Tool* were conducted on 3 June 2011 to identify threatened flora or fauna species, populations, Endangered Ecological Communities (EECs) and migratory/marine species listed under the TSC Act and/or the EPBC Act which have been recorded or predicted to occur within a 10 km radius of the subject site. The results of these searches are provided in Appendix I.

The key findings are as follows:

- Fourteen threatened flora species have been identified as having been previously recorded or predicted to occur within 10 km of the Site.
- One threatened ecological community has been identified as being predicted to occur within 10 km of the Site.
- Forty-five threatened terrestrial fauna species have been identified as having been previously recorded or predicted to occur within 10 km of the Site.
- Two populations of threatened terrestrial fauna species have been identified as having been previously recorded or predicted to occur within 10 km of the Site.
- Twenty-seven threatened marine and migratory marine species have been identified as having been previously recorded or predicted to occur within 10 km of the Site.
- One threatened migratory marine species has been identified as having been predicted to occur within 10 km of the Site.

The Site is located within 3 km of the Hunter Estuary National Park and 4 km of the Kooragang Island Nature Reserve, which forms part of the Ramsar-listed Hunter Estuary Wetlands. The wetlands are an important area for migratory and Australasian wetland species, including species protected under the Agreement Between the Government of Japan and the Australian Government for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA) and the Agreement Between Australia and the People's Republic of China for the Protection of Migratory Birds and Their Environment (CAMBA).

16.3 Matters of National Environmental Significance

In addition to State-based approvals, actions that may significantly affect matters of National Environmental Significance (NES) require assessment and/or approval from the Commonwealth under the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*. The EPBC Act lists eight matters of NES that must be addressed when assessing the environmental impacts of a proposal. These matters are:

- World heritage properties
- National heritage places
- Ramsar wetlands of international importance
- Threatened species and ecological communities
- Migratory species
- Nuclear actions (including uranium mining)

- Commonwealth marine area
- Great Barrier Reef Marine Park.

The Proposed Project is not anticipated to have a significant impact on any of these matters. The Site is located within 4 km of the Kooragang Island Nature Reserve which is a Ramsar listed wetland. However, it is predicted that the Proposed Project would not impact on this protected area. No approval therefore would to be required under the EPBC Act. Refer to Table 39 for additional detail.

16.4 Predicted Impacts

The proposed project is unlikely to have a significant effect on native flora and fauna. The site has been highly disturbed by historic industrial activities and, as such, contains little or no habitat value for native species. The proposed project incorporates measures to reduce off-site impacts and it is, therefore, unlikely that the works would affect the Hunter River or other native flora and fauna in the areas surrounding the site.

Landscaping is proposed for the site in areas adjacent to the office and visitor/staff car parking (Figure 6), using native endemic vegetation species.

No weeds have been identified on the project site. In the event of any future weed infestation, these will be dealt with under the Site Management Plan (SWP).

16.5 Mitigation Measures

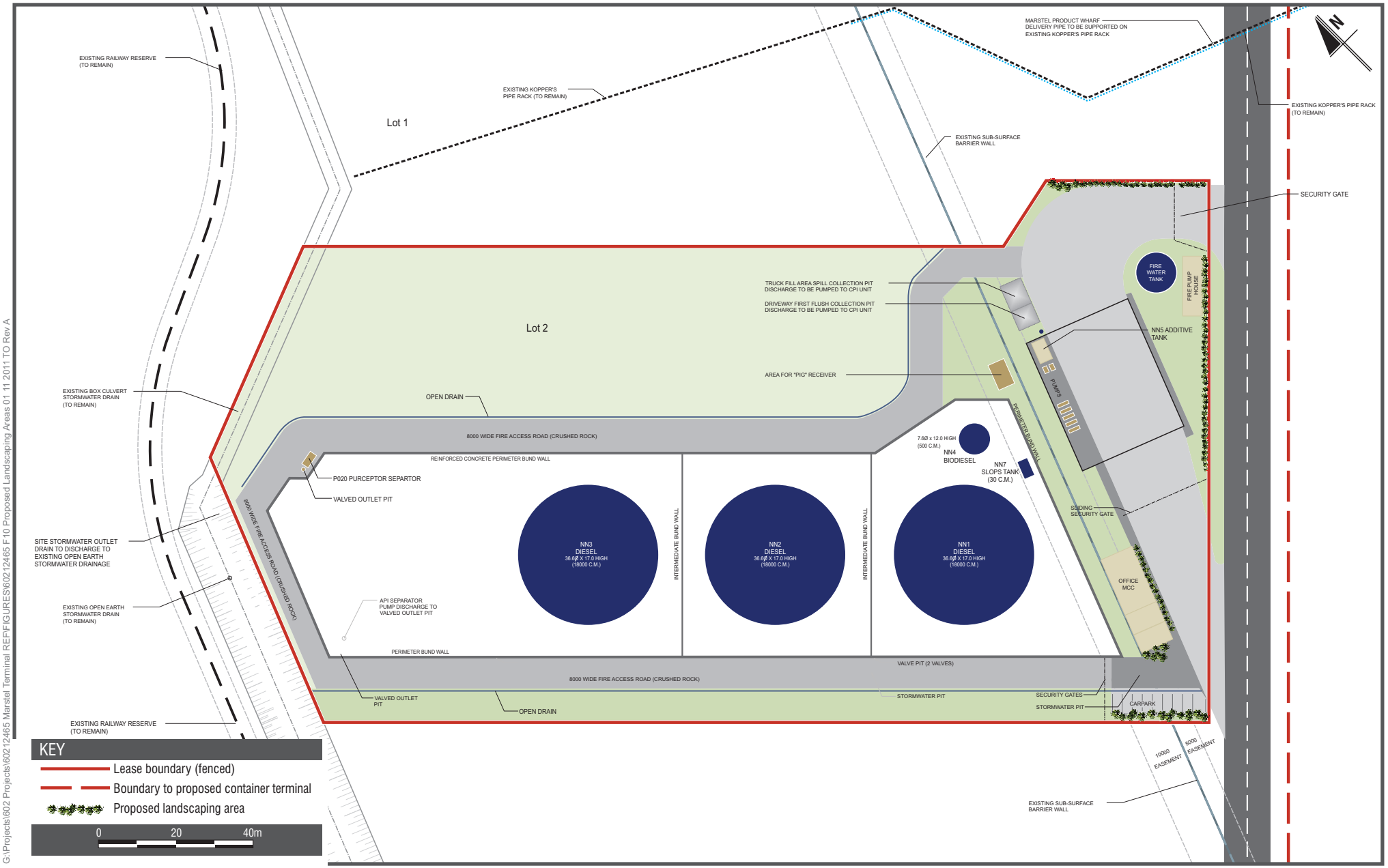
The Site has been highly disturbed by historic industrial activities and, as such, does not contain habitat value for native species. A visual inspection of the Site indicates that there is no vegetation present on the Site. It can therefore be concluded that none of the above species or their habitats occur on the Site. The Proposed Project incorporates measures to reduce offsite impacts and it is, therefore, unlikely that the works would affect the Hunter River or other native flora and fauna in the areas surrounding the Site. The CEMP and SMP would detail procedures for managing native flora and fauna if encountered onsite.

Indirect emissions from a spill of product (through a mechanism such tank farm leakage or spill at wharf) may impact though tidal flows towards the upstream natural environments of the Hunter Wetlands. However, the likelihood of such events are very low and precautionary and response measures have been implemented to manage the risk.

Landscaping is proposed for the Site in areas adjacent to the office and visitor/staff car parking, using native endemic vegetation species. No weeds have been identified on the project Site. In the event of any future weed infestation, these would be dealt with under the Site Management Plan (SMP) to be prepared, as identified in Section 3.6.4 and Figure 10.

16.6 Conclusion

The proposed project would also be unlikely to have a significant effect on native flora and fauna. The mitigation measures would prevent significant impacts occurring for native species, populations and ecological communities within the vicinity of the Site.



G:\Projects\602 Projects\60212465 Marstel Terminal REF\FIGURES\60212465 F10 Proposed Landscaping Areas 01 11 2011 TO Rev A

AECOM

PROPOSED LANDSCAPING AREAS

Environmental Assessment
Port of Newcastle, New South Wales

FIGURE 10

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17.0 Indigenous Heritage

17.1 Existing Conditions

A search of the National Parks and Wildlife Service Register of Aboriginal Sites (now known as the OEH's Aboriginal Heritage Information Management System) database was carried out as part of the Environmental Impact Statement titled Development of a Multi Purpose Terminal and Remediation of the Closure Area, BHP Newcastle Steelworks (URS, 2000). No indigenous heritage sites were identified through that search and therefore it was presumed that any indigenous value would have been removed or destroyed during previous reclamation, construction, operational and rehabilitation activities associated with the BHP Steelworks. Alternatively, it may have been the case that no such objects or sites existed at the location. Therefore, the impact to sites of indigenous heritage significance is negligible given that no known sites have been recorded in the area and given the completely modified nature of the site.

17.2 Mitigation Measures

The persons responsible for management would ensure all staff, contractors and others involved in construction and maintenance related activities are made aware of the statutory legislation protecting sites and places of significance. Section 86 of the National Parks and Wildlife Act makes it an offence to destroy, deface or damage, or cause or permit the destruction or defacement of or damage to, an object or Aboriginal place without first obtaining the consent of the OEH.

In the event that natural soil profiles are encountered during site works, a qualified archaeologist and representatives of Aboriginal community groups shall be consulted. If any Aboriginal sites or relics are found during the construction phase of the development, all work in the vicinity of the finding would cease and the archaeologist, members of the Aboriginal community and the OEH would be contacted.

17.3 Conclusion

It is extremely unlikely that indigenous objects or places would be found on the Site due to the high level of past disturbance. However, in the unlikely event that such a site or item is discovered, the mitigation measures outlined in Section 17.2 would minimise potential impacts.

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18.0 Non-Indigenous Heritage

18.1 Existing Conditions

The subject site forms part of a larger industrial area which was purchased by BHP in 1896 for the establishment of an industrial complex for steel production. During the industrial history of the site a large number of buildings have historically existed onsite. The type, location and usage of buildings on lands in the immediate vicinity of the site have experience ongoing modification during their lifetime, progressive decommissioning. Some have since been demolished.

Successive heritage studies of the site have been undertaken. In particular a *Conservation Plan* (EJE, 1991) was prepared in support of incorporating the steelworks site heritage into the Newcastle LEP. Further heritage assessment and Statements of Heritage Impacts where also prepared in support of applications to demolish the site and allow for the development of what is now known as the Multi Purpose Terminal area.

Investigations into the potential for heritage items to occur within the vicinity of the Site were conducted on 3 June 2011 by a desktop search of the following:

- LEP 2003
- State Heritage Inventory
- State Heritage Register
- Register of the National Estate.

Refer to Appendix H for the results of these heritage searches. Fifty-four heritage locations were found in the Mayfield area (refer Table 38). Most of these are historically significant residences, public buildings such as churches, or former industrial facilities. The locations of these heritage sites are also provided in Figure 11.

Table 38 Non-indigenous Heritage

Location No	Address	Heritage Item Name	Listed Under
1	28 Bull Street Mayfield	Residence	- State Heritage Inventory - LEP 2003
2	74 Bull Street Mayfield	Residence	- State Heritage Inventory - LEP 2003
3	1 Buruda Street Mayfield West	Maternity Hospital (Former)	- State Heritage Inventory - LEP 2003
4	24-30 Crebert Street Mayfield East	Botanic Garden Site (Former)	- State Heritage Inventory - LEP 2003
5	31A Church Street Mayfield	St Andrews Church	- State Heritage Inventory - LEP 2003
6	39 Church Street Mayfield	St Columban's Primary School	- State Heritage Inventory - LEP 2003
7	58 Church Street Mayfield	St Columban's Presbyterian Church	- State Heritage Inventory - LEP 2003
8	34 Crebert Street Mayfield	Mayfield East Public School	- State Heritage Inventory - LEP 2003
9	47 Crebert Street Mayfield	Ingall House Group	- State Heritage Inventory - LEP 2003
10	51 Crebert Street Mayfield	Ingall House Group	- State Heritage Inventory - LEP 2003
11	61 Crebert Street Mayfield	Ingall House	- State Heritage Inventory - LEP 2003
12	105 Crebert Street Mayfield	Bella Vista (Former Residence)	- State Heritage Inventory - LEP 2003

Location No	Address	Heritage Item Name	Listed Under
13	138A Crebert Street Mayfield	Substation (Former)	- State Heritage Inventory - LEP 2003
14	141 Crebert Street Mayfield	Residence	- State Heritage Inventory - LEP 2003
15	143 Crebert Street Mayfield	Winncourt (Residence)	- State Heritage Inventory - LEP 2003
16	145 Crebert Street Mayfield	Residence	- State Heritage Inventory - LEP 2003
17	147 Crebert Street Mayfield	Residence	- State Heritage Inventory - LEP 2003
18	149 Crebert Street Mayfield	Tongarra (Residence)	- State Heritage Inventory - LEP 2003
19	1 Durham Street Mayfield	Former St Andrews Rectory	- LEP 2003
20	41 Elizabeth Street Mayfield	House and Picket Fence	- State Heritage Inventory - LEP 2003
21	72 Elizabeth Street Mayfield	House and Picket Fence	- State Heritage Inventory - LEP 2003
22	Fitzroy Street (36 Waratah Street)	Mayfield Fitzroy Substation	- State Heritage Inventory
23	3 Fitzroy Street Mayfield	Catholic School of Christ the King, Former	- State Heritage Inventory - LEP 2003
24	33A Hanbury Street Mayfield	St John Presbyterian Church	- State Heritage Inventory - LEP 2003
25	86A Hanbury Street Mayfield	Webb Park	- State Heritage Inventory - LEP 2003
26	88 Hanbury Street Mayfield	Residence	- State Heritage Inventory - LEP 2003
27	8 Hann Street Mayfield	Hann Street Distribution Substation	- State Heritage Inventory
28	52 Havelock Street Mayfield	Hunter Institute of Technology	- State Heritage Inventory - LEP 2003
29	78 Havelock Street Mayfield	San Clemente School	- State Heritage Inventory - LEP 2003
30	21 Highfield Street	Mayfield House	- State Heritage Inventory - LEP 2003
31	25 Highfield Street Mayfield	Winahra (Residence)	- State Heritage Inventory - LEP 2003
32	29-31 Highfield Street Mayfield	Church House	- State Heritage Inventory - LEP 2003
		Mayfield Uniting Church	- State Heritage Inventory - LEP 2003
33	51 Industrial Drive Mayfield North	Administration Building Nos 2, 3 and 4	- State Heritage Inventory - LEP 2003
		No1 Bloom & Rail Mill	- LEP 2003
		No 1 Change House	- LEP 2003
		1st Mill Building	- LEP 2003
34	64 Industrial Drive Mayfield	Simpsons Cottage	- State Heritage Inventory - LEP 2003

Location No	Address	Heritage Item Name	Listed Under
35	141 Ingall Street Mayfield North	Administrative Building (1933)	- State Heritage Inventory - LEP 2003
		Apprentice Training Centre	- State Heritage Inventory - LEP 2003
36	6 George Street Mayfield East	Australia Wire Rope Building	- State Heritage Inventory - LEP 2003
37	7 Gregson Avenue Mayfield West	Mayfield West Public School	- State Heritage Inventory - LEP 2003
38	15 Kerr Street Mayfield	Residence	- State Heritage Inventory - LEP 2003
39	41 Kerr Street Mayfield	Glen Airlie (Arnott Residence)	- State Heritage Inventory - LEP 2003
40	76 Kerr Street Mayfield	Residence	- State Heritage Inventory - LEP 2003
41	50 McIntosh Drive Mayfield West	Remnant Garden	- State Heritage Inventory
42	39 Maitland Road Mayfield	Beauford Hotel	- State Heritage Inventory
43	116-122 Maitland Road Mayfield	The Coliseum (Commercial Building)	- State Heritage Inventory - LEP 2003
44	185 Maitland Road Mayfield	Stag & Hunter Hotel	- State Heritage Inventory - LEP 2003
45	219-221A Maitland Road Mayfield	Mayfield Police Station	- State Heritage Inventory - LEP 2003
46	358 Maitland Road Mayfield	Elladale	- State Heritage Inventory - LEP 2003
47	92 Margaret Street Mayfield East	Residence	- State Heritage Inventory - LEP 2003
48	94 Margaret Street Mayfield	Residence	- State Heritage Inventory - LEP 2003
49	2C Maud Street Mayfield	Electricity Substation	- State Heritage Inventory
50	2 Pitt Street Mayfield	Burrundulla (Residence)	- State Heritage Inventory - LEP 2003
51	4 Pitt Street Mayfield	Burgman House	- State Heritage Inventory - LEP 2003
52	99 Selwyn Street Mayfield North	BHP Administration Building	- State Heritage Inventory
		Delprat's Quarters	- State Heritage Inventory - LEP 2003
		Master Mechanics Office	- State Heritage Inventory - LEP 2003
		Mould Conditioning Building	- State Heritage Inventory - LEP 2003
		Original Timber Wharves	- State Heritage Inventory - LEP 2003
		Pattern Store	- State Heritage Inventory - LEP 2003
		Quality Control Laboratory	- State Heritage Inventory - LEP 2003
		Remnant No. 1 Blast Furnace	- State Heritage Inventory - LEP 2003

Location No	Address	Heritage Item Name	Listed Under
		Tool Room	- State Heritage Inventory - LEP 2003
53	68 Woodstock Street Mayfield	Remnant Monastery Garden	- State Heritage Inventory - LEP 2003
		Redemptorist Monastery	- State Heritage Inventory - LEP 2003
54	3 Victoria Street Mayfield	Salvation Army Citadel	- State Heritage Inventory - LEP 2003

Twenty-three items are actually listed at the address of 99 Selwyn Street Mayfield North, which is part of the former BHP site. However, 14 of these items are listed as demolished. Due to the distance of the proposal in relation to the listed heritage items, it is anticipated that the proposed works would not impact on these heritage listed items. The closest items the to the proposed bulk fuel facility are the original timber wharves and the Number 1 Change house located at 250 m and 600 m respectively).

As part of the development application for the redevelopment of the former Steelworks Site an Archaeological Management Plan (AMP) was prepared by EHE Architecture and Umwelt (Australia) Pty Ltd in July 2001. The AMP defines the nature, location and strategic management of archaeological resources on the former Steelworks Site during and after demolition. 14 sites proposed for demolition in the AMP. These were: No. 1 Blast Furnace, No. 1 Blower House, Original Open Hearth Building, No. 1 Bloom and Rail Mill Building, Steel Foundry, DC Substation, Original Timber Wharves, No. 3 Blast Furnace, AC Saltwater Pumphouse, Powerhouse, Open Hearth Change House, Mould Conditioning Building, BOS Plant and No. 4 Blast Furnace.

Heritage resources that were to be maintained on the steelworks site for development of an interpretation facility were the archaeological site of the Hunter River Smelting Co, the Chief Engineer's Office and the Pattern Store. No heritage sites have been retained, or were present on the Site of the proposed Facility.

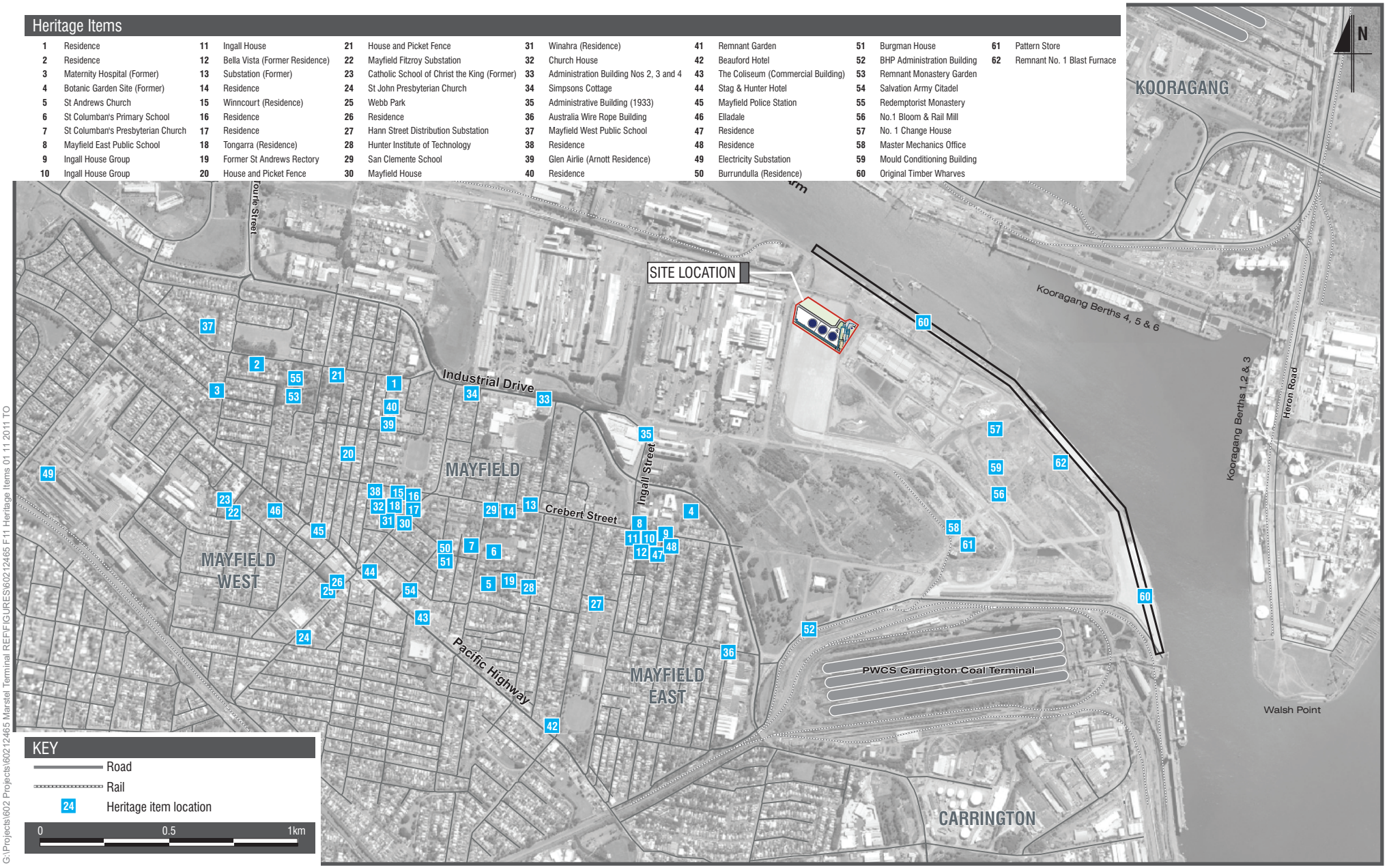
A Heritage Precinct was identified on the corner of Industrial drive and Ingall Street. As traffic generated by the development would pass this site, consideration was given the impacts this traffic may pose on the heritage precinct. RTA traffic count stations 05.953 (Industrial Drive NW of Woodstock Street) and 05.979 (Industrial Drive West of Werribi Street) provide Average Annual Daily Traffic (AADT) of 30,717 and 23,339 respectively in 2004. As described in Section 13.0 the development will only generate an estimated 18 tankers and 10 light vehicles per day. With construction traffic representing approximately 0.12% of road traffic (based on 2004 figures) on industrial Drive, any additional impacts on heritage items adjoining the road corridor are considered negligible. Furthermore project traffic would be travelling at reduced speeds when accessing the site, reducing and noise and vibration being generated in the vicinity of the heritage precinct.

18.2 Conclusion

Whilst there are numerous heritage items in the surrounds of the proposed Site, none of them are close enough to be impacted on by the construction or operation of the proposed Facility. Therefore, no specific mitigation measures are required to protect non-indigenous heritage items. In the extremely unlikely event that heritage items are located during construction, work would cease in that area and the OEH would be contacted for advice.

Heritage Items

1	Residence	11	Ingall House	21	House and Picket Fence	31	Winahra (Residence)	41	Remnant Garden	51	Burgman House	61	Pattern Store
2	Residence	12	Bella Vista (Former Residence)	22	Mayfield Fitzroy Substation	32	Church House	42	Beauford Hotel	52	BHP Administration Building	62	Remnant No. 1 Blast Furnace
3	Maternity Hospital (Former)	13	Substation (Former)	23	Catholic School of Christ the King (Former)	33	Administration Building Nos 2, 3 and 4	43	The Coliseum (Commercial Building)	53	Remnant Monastery Garden		
4	Botanic Garden Site (Former)	14	Residence	24	St John Presbyterian Church	34	Simpsons Cottage	44	Stag & Hunter Hotel	54	Salvation Army Citadel		
5	St Andrews Church	15	Winncourt (Residence)	25	Webb Park	35	Administrative Building (1933)	45	Mayfield Police Station	55	Redemptorist Monastery		
6	St Columban's Primary School	16	Residence	26	Residence	36	Australia Wire Rope Building	46	Elladale	56	No.1 Bloom & Rail Mill		
7	St Columban's Presbyterian Church	17	Residence	27	Hann Street Distribution Substation	37	Mayfield West Public School	47	Residence	57	No. 1 Change House		
8	Mayfield East Public School	18	Tongarra (Residence)	28	Hunter Institute of Technology	38	Residence	48	Residence	58	Master Mechanics Office		
9	Ingall House Group	19	Former St Andrews Rectory	29	San Clemente School	39	Glen Airlie (Arnott Residence)	49	Electricity Substation	59	Mould Conditioning Building		
10	Ingall House Group	20	House and Picket Fence	30	Mayfield House	40	Residence	50	Burrundulla (Residence)	60	Original Timber Wharves		



G:\Projects\602 Projects\60212465 Marstel Terminal REF\FIGURES\60212465 F11 Heritage Items 01 11 2011 TO

AECOM

HERITAGE ITEMS

Environmental Assessment

Port of Newcastle, New South Wales

FIGURE 11

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19.0 Other Environmental Considerations

Additional environmental issues have been assessed. However these issues have been identified as having less significant potential for adverse impacts. These additional issues are addressed in Table 39 and include:

- Social and economic
- Utilities
- Demand on Resources.

Table 39 Other Environmental Issues

Issue	Consideration	Residual Impact
Social / Economic	The Proposed Project would generate positive economic benefits for Newcastle and the Hunter Region through the significant capital investment and establishment of port infrastructure. The facility would support the development and growth of the Hunter Region. It would also contribute to the beneficial industrial reuse of the former Site and fits with the Regional Economic Development Strategy. Regional industries would directly benefit from access to competitive fuel prices, which would also provide indirect benefits to the Hunter in the form of increased investment in infrastructure and services. The number of permanent staff required to operate the facility is minimal, with two employees onsite during operation plus tanker drivers, and approximately 12 additional staff required when ship unloading operations are underway. The facility would indirectly generate employment in the region through increased economic activity (driven by the flow-on benefits for industry of a cost-effective fuel supply) and the ready access to an independent bulk liquids terminal. Importantly the proposal will see the development of currently idle port land for a port related use, and provide a diversified use of port land in Newcastle. Diversification is seen as a key factor in improving the resilience of economies when responding to economic downturns or corrections.	Positive
Utilities	The Site is to be serviced by utilities including electricity, gas, water and sewer. It is proposed that these utilities would be provided to the Site by NPC. The Site amenities would be serviced by an onsite system, which would be serviced by an appropriate contractor. The proposal would not impact upon the delivery of services to any existing adjacent land use.	Low
Demand on Resources	The proposal would have minimal impact on the demand for resources. Electricity demand would be used for product transfer pumps, site lighting, system operations and office block. Fire pumps are to be driven by diesel and the heating of the fuel oil via natural gas The Site is for the storage of fuels and biofuels and is not considered to be a place of high demand on resources. With the inclusion of Biofuels, the facility will provide businesses with an alternative to fuels derived totally from subterranean oil supplies thereby reducing demand on this resource.	Low

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20.0 Residual Risk Analysis

The Environmental Risk Analysis for the Proposed Project is based on a process adapted from *Australian Standard AS 4369:1999 Risk Management*. The process is qualitative and is based on the Residual Risk Matrix shown in Table 42.

Residual Environmental Risk is assessed on the basis of the significance of environmental effects of the Proposed Project and the ability to confidently manage those effects to minimise the risk of harm to the environment.

The significance of environmental effects of given a numerical value between one and five, based on:

- The receiving environment (its sensitivity and values).
- The level of understanding of the type and extent of impacts.
- Likely community response to the environmental consequences of the Project.

The manageability of environmental effects is similarly given a numerical value between one and five based on the complexity of mitigation measures, the known level of performance on the safeguards proposed, and the opportunity for adaptive management. The numerical value allocated for each issue is based upon the following prescription.

Table 40 Significance of Effects

No	Significance	Receiving Environment
5	Extreme	Undisturbed receiving environment, type or extent of impacts unknown, substantial community concern.
4	High	Sensitive receiving environment, type or extent of impacts not well understood; high level of community concern.
3	Moderate	Resilient receiving environment, type and extent of impacts understood; community interest.
2	Minor	Disturbed receiving environment; type and extent of impacts well understood; some local community interest.
1	Low	Degraded receiving environment; type and extent of impacts fully understood; uncontroversial project.

Table 41 Manageability of Effects

No	Significance	Mitigation Measures
5	Complex	Complicated array of mitigation measures required; safeguards or technology are unproven; adaptive management inappropriate.
4	Substantial	Significant mix of mitigation measures required; past performance of safeguards is understood; adaptive management feasible.
3	Straightforward	Straightforward range of mitigation measures required; past performance of safeguards is understood; adaptive management easily applied.
2	Standard	Simple suite of mitigation measures required; substantial track record of effectiveness of safeguards; adaptive management unlikely to be required.
1	Minimal	Little or no mitigation measures required; safeguards are standard practice; adaptive management not required.

The chosen numbers are added together to provide a result which provides a ranking of potential residual effects of the Project when the safeguards identified in this EA are implemented.

Table 42 Residual Risk Matrix

Significance of Effects	Manageability of Effects				
	5 Complex	4 Substantial	3 Straightforward	2 Standard	1 Minimal
1 Low	6 Medium	5 Low/Medium	4 Low/Medium	3 Low	2 Low
2 Minor	7 High/Medium	6 Medium	5 Low/Medium	4 Low/Medium	3 Low
3 Moderate	8 High/Medium	7 High/Medium	6 Medium	5 Low/Medium	4 Low/Medium
4 High	9 High	8 High/Medium	7 High/Medium	6 Medium	5 Low/Medium
5 Extreme	10 High	9 High	8 High/Medium	7 High/Medium	6 Medium

20.1 Analysis

The analysis of residual environmental risk for issues related to the Proposed Project is shown in Table 43. This analysis indicates the environmental risk profile for the Proposed Project based on the assessment of environmental effects, the identification of appropriate safeguards, and the Statement of Commitments shown in this EA.

Table 43 Risk Profile – Proposed Upgrade

Issue	Significance	Manageability	Residual Risk
Hazard and Risk	3	2	5 Low/Medium
Surface Water Management	3	2	5 Low/Medium
Air Quality	2	2	4 Low/Medium
Groundwater	2	1	3 Low
Soil	1	1	2 Low
Acid Sulfate Soils	1	1	2 Low
Noise and Vibration	2	1	3 Low
Traffic and Transport	2	2	4 Low/Medium
Visual	2	1	3 Low
Greenhouse Gas Emissions	3	1	4 Low/Medium
Waste Management	1	1	2 Low
Terrestrial Ecology	1	1	2 Low
Heritage	1	1	2 Low
Utilities	1	1	2 Low
Demand on community, natural or transport resources	1	1	2 Low
Socio-Economic	1	1	2 Low

20.2 Conclusion

The above residual risk analysis indicates that the proposed Bulk Fuel Storage Facility, including appropriate safeguards as outlined in this EA, would give rise to predominantly a low to low/medium risk in relation to the identified environmental issues. Environmental issues associated with the proposed facility that are considered of medium risk are “Hazard and Risk” and “surface water management”, due to the level of community interest.

21.0 Statement of Commitments

21.1 Introduction

In accordance with the Director-General's Environmental Assessment Requirements (Appendix A), the following draft Statement of Commitments (SoC) states Marstel's environmental commitments and provides a summary of the environmental management and monitoring of the proposed project during its construction and operations.

Marstel commits to the preparation and implementation of the environmental management and monitoring plans and environmental mitigation measures detailed in the SoC for the proposed terminal facility.

21.2 Summary of Safeguards

Provided in Table 44 is a summary of the safeguards which would be implemented during the construction and operation of the terminal facility.

Table 44 Summary of Safeguards

Issue	Safeguard
Hazard and Risk	- A 50 kg wheeled dry powder extinguisher would be installed onsite. - A fire monitor would be placed no less than 29 m from the wharf hose connection point. - Fuel loading and unloading would be automated through a central computerised system, including automatic shut down in the event of an emergency, - Operations would not take place without an Fire Safety Plan (approved by NSW Fire Brigade) in place, - All systems, including fire safety and fuel management would be maintained and operated in accordance with manufactures instruction and relevant standards.
Surface Water	- An Erosion and Sediment Control Plan is to be developed and implemented for the construction phase. - Surface water would be managed in accordance with the Stormwater Management Plan. - A regular inspection of pipeline integrity would be undertaken during fuel transfer. - All ship bulk product transfers would be operated in accordance with ISGOTT procedures.
Groundwater	- An impermeable line (claymix liner) would be installed across the Site to protect groundwater below the Site. - Installation of two up gradient and two down gradient monitoring wells prior to site operation. - Groundwater would be tested for the range of analytes prior to any dewatering activities.
Soils	- Any soils that are encountered below the VENM Capping layer would be managed in accordance with the existing CSMP relevant to the Site. - Any disturbance to existing capping to be re-instated to CSMP requirements. - No soils would be disposed of offsite prior to waste classification.
Air Quality and odour	- It is anticipated that VOC and odour emissions from the Site would meet relevant criteria at sensitive receiver locations. - Dust mitigation strategies shall be implemented as part of the CEMP and shall include: • Disturbed surfaces would be stabilised as soon as practical. • All vehicles leaving the Site would not have excessive soil on their tyres which may fall onto the roadways creating dust emissions. • Roadways are to be kept clean during construction and operation. • Any stockpiled material would be sprayed with water during times of high wind.

Issue	Safeguard
Noise	- Except during ship unloading at berth, the Site would operate 24 hours a day, 365 days per year.
Maritime Safety	- Ships would not be anchored off shore. - Ships would be brought into Newcastle Port by tugs and direction of the Harbour Master.
Terrestrial Ecology	- The ecological values of the Site do not provide potential habitat for native flora and fauna. As such, specific flora and fauna management plans are not required for the construction or operation of the Facility.
Heritage	- In the event natural soil profiles are excavated a qualified archaeologist and aboriginal representative are to be consulted. - In the event that non-indigenous heritage items are uncovered, NSW Heritage Branch is to be consulted.
Security	- A comprehensive security system is to be installed onsite prior to operation.

21.3 Environmental Management and Monitoring

Environmental management practices would be an integral component of the construction and operation of the proposed terminal facility. These would incorporate the identified safeguards as detailed in the previous section and the various procedures that would be implemented on the site. These would also be developed to be consistent with the CEMP and the CSMP.

Environmental management would be detailed in a number of documents that would be produced specific to the construction and operation of the Site. Such plans would reference other specific management plans and monitoring required and are summarised in Table 45.

Table 45 Management Plans

Management Plan	Timing	Content
Construction Environmental Management Plan (CEMP)	Prior to construction	- Routine inspection of plant and equipment onsite. - Erosion and Sediment Control Plan. - Regular audit of environmental compliance onsite. - Testing of dewatered groundwater. - Management of wastes, weeds and soils onsite.
Port Operations Management Plan	Eight weeks prior to first vessel to enter the port	- Navigation of vessels. - Location of lighting. - Movements within the port. - Communication. - Tie up facilities and floating equipment. - Notification requirements. - Risk assessments for all activities.
Wharf Emergency Response Plan	Four weeks prior to fuel receival	- Spill response procedures. - Emergency drills/exercise.

Management Plan	Timing	Content
Site Management Plan (SMP)	Prior to the commencement of operations	- Stormwater Management Plan (SWMP). - Groundwater Monitoring. - Waste management procedures. - Fuel transfer procedure and pipeline inspections. - Spill response procedures at the terminal. - Landscaping and maintenance including weed and fauna management. - Routine site inspections and monitoring. - Consultation and complaint handling procedure.

Routine emissions monitoring would form a component of the SMP. This is summarised in Table 46.

Table 46 Monitoring

Issue	Location	Parameters
Surface Waters	- *Insitu* inspection and testing at the bunds. - *Insitu* inspection and testing at the bund water retention pit. - Laboratory testing of stormwater in the bund retention pit. - Laboratory testing of stormwater in the first flush pit. - Laboratory testing of stormwater in the truck fill area spill collection pit, when water has accumulated.	*Insitu* testing for: - pH - Dissolved oxygen - Electrical conductivity Laboratory testing for: - pH - Total Organic Carbon - Suspended Solids - Total petroleum hydrocarbons
Groundwater	2 Up gradient 2 Down gradient	- pH - Electrical Conductivity - Metals - PAHs - TPH - BTEX

21.4 Commitments

The SoC has been prepared in respect of the construction and operation of the proposed terminal facility and has been compiled on an issues basis, as informed by the EA and the environmental risk analysis. The SoC has been written in a format which can be incorporated into approval conditions and is shown in Table 47.

Table 47 Statement of Commitments

Environmental Issues	Commitments
Management Plan	- Prior to construction, a Construction Environmental Management Plan shall be developed in consultation with OEH incorporating the management of soils, surface waters, weed management, air quality and odour, noise and waste management. - Prior to operation, Marstel would prepare an Emergency Plan for the proposed Facility (to be available onsite) and a Wharf Emergency Plan (available at the wharf) in consultation with the NSW Fire Brigade, NPC and NSW Maritime. These plans are to include: • Spill response procedures. • Fire response procedures. • Response procedures for other identified environmental impacts. • Procedures for emergency drills/exercises. - Prior to operation, a Site Management Plan shall be developed in consultation with OEH that would detail the ongoing monitoring and environmental management requirements for the facility. - Eight weeks prior to the first vessel entering the port, a Port Operations Management Plan shall be developed in consultation with NPC. - A Tank Farm Bunding Detailed Design and Construction Report shall be provided prior to the commencement of construction as per OEH requirements. - Specific mitigation measures to manage the risks of fire and/or explosion resulting from tank and/or pipeline incidents are outlined in section 7.2.
Hazards and Risks	- All ship movements and fuel unloading shall be undertaken in accordance with procedures outlined in ISGOTT and the safeguards outlined in Table 10 and coordinated to compounding cumulative risk. - The proponent shall install a 50 kg dry powder extinguisher on wheels. - The proponent shall install a fire water tank and fire hydrants within 60 m of the fuel transfer location. Fire monitors with foam generation installed near to fuel storage and transfer points. - The proponent shall implement a fuel transfer procedure in which an inspection of the pipeline route would be conducted. - The proponent shall install a fire monitor at a minimum of 29 m from the wharf hose connection point. - Plant maintenance schedules shall include the following: • Annual testing of fire detectors at the site. • Weekly tests of the fire pump systems and foam activation valves. - Wharf area where fuel lines located is bunded to prevent direct spills to the Hunter River. - Spill containment boom are available to be deployed around the ship and wharf for all delivery/transfer operations. - Spill kits available. - Ship is tied with two lines at every tie point. - Pipeline fully welded, non-destructive tested, designed to withstand full pressure, pigged after each delivery, painted to prevent external corrosion. - Pipeline transfer fully monitored by ship and shore facilities (i.e. pressure, flow, etc

Environmental Issues	Commitments
Surface Water Management	*Construction* - The proponent shall prepare and implement a Construction Environmental Management Plan (CEMP) which shall include a detailed Erosion and Sediment Control Plan (ESCP). *Operation* - The proponent shall prepare a stormwater management system that is designed and implemented to capture stormwater from the Site, to prevent leaks and spills from occurring and to facilitate the discharge of clean stormwater to the Hunter River. - Surface water shall be managed in accordance with the stormwater management plan developed for the Site. - The proponent shall implement an inspection and testing program of the stormwater system as detailed in the stormwater management plan. - Pipeworks, fuel storage and tanker/loading areas fully bunded. - Tanks monitored during filling by ship and shore, levelling alarms fitted. - Tanks regularly inspected for corrosion and leaks. Water build up in tanks regularly drained to prevent internal corrosion. - Tank level monitoring conducted at all times to identify rapid leaks. - Pump operation only conducted when Facility staffed and operations can be continually monitored.
Groundwater	- A claymix liner shall be installed over the Site (non concreted areas) and overlain with bitumen to create an impervious seal across the Site and up the sides of the bund wall. - The proponent shall prepare and implement a Site Management Plan (SMP) which shall include a schedule for groundwater sampling for pH, EC, TPH, BTEX, metals and groundwater flow rate.
Soil	- Excavation, classification, treatment and disposal of Potential Acid Sulfate Soils and contaminated materials shall be undertaken in accordance with requirements detailed in the CEMP and CSMP. - All works to be undertaken onsite would comply with the existing Contaminated Site Management Plan relevant to the Site. - There is to be no transportation of material from below the VENM capping layer without prior approval from OEH. - Material imported to the Site shall be classified in accordance with NSW EPA (December 1994) prior to receipt. - Ongoing soils management will include any applicable actions as required by the CSMP.
Air Quality	- Dust mitigation strategies shall be implemented as part of the CEMP and shall include: • Disturbed surfaces would be stabilised as soon as practical. • All vehicles leaving the Site would not have excessive soil on their tyres which may fall onto the roadways creating dust emissions. • Roadways are to be kept clean during construction and operation. • Any stockpiled material would be sprayed with water during times of high wind.
Noise and Vibration	- Other than during the unloading of ships, the proponent shall not conduct noise sensitive activities on Sundays and public holidays. - During operation of the facility, the proponent would liaise with residents potentially affected by noise.

Environmental Issues	Commitments
Traffic and Transport	- Off street car parking shall be available to staff and visitors during normal operations. - All trucks shall enter and exit the Site via left in and left our configuration.
Visual and Landscaping	- Landscaping in the vicinity of the car park and office/workshop area shall be undertaken with suitable native species in consultation with NCC. - The Site shall remain clean and free or rubbish or debris as a result of operations. - Plantings on the Site are to comprise a mixture of native species endemic to the area.
Waste Management	- Purchasing requirements for construction shall be such that products purchased for the Site would align with site demands to avoid wastage of unwanted products. - The proponent shall implement a system for recycled paper, cardboard, glass and plastics. Bins shall be collected by a waste management contractor on a regular basis. - Recycling of waste material shall be maximised wherever possible during operation of the facility.
Indigenous and Non-Indigenous Heritage	- Monitoring of the Site shall be undertaken in the event natural soil profiles are to be excavated.
Security	- A comprehensive security system shall be installed onsite and shall include monitoring of all fences and entry/exit points to the Site. - Gantry area is under closed circuit television (CCTV) surveillance at all times, with screens in the main site office.
Soils and Landform	- The proponent shall minimise the erosion and potential discharge of sediments from the Site as outline above for Surface Water and Groundwater.

22.0 Consistency with Concept Plan

This Project Application 08_0130 is being run concurrently with NPPC's Mayfield Concept Approval Submission (09_0096). The Mayfield Concept Approval Submission relates to a larger area of land which would contain an array of port related facilities, and not just the Marstel Facility.

Table 48 in this section contains a summary of the Statement of Commitments which were included in the *Mayfield Site Port-Related Activities Concept Plan – Environmental Assessment* (AECOM, 2010) for the Mayfield Concept Approval Submission (09_0096), and details of how the proposed project is consistent with the objectives and criteria set out in that submission.

At the time of writing the Mayfield Concept Approval Submission (09_0096) had not been approved. As such the final Statement of Commitments contained in the approval for the Concept Plan 09_0096 may differ slightly from those discussed in Table 48. For this reason the specific Environmental and Performance Management requirements described in the Mayfield Concept Approval Submission have not been addressed. It is considered that these specific requirements will be addressed in the various management plans and post approval documentation that will need to be prepared and approved prior to the construction and operation of the proposed Marstel Facility.

Table 48 Consistency with Concept Plan EASRs

Mayfield Concept Approval Submission (09_0096) Statement of Commitments Summary.	Marstel Facility Project Application (08_0130)
General	
NPC would ensure that Project applicants meet the following general performance requirements: - Prepare Project applications in a manner which is generally consistent with the key assumptions and recommendations contained in this Concept Plan and EA. - Develop and operate individual facilities in a manner which is generally consistent with the Concept Plan and this EA. - Develop and operate individual facilities in compliance with the mitigation and management measures contained in this SoC, where applicable.	This Project Application has been prepared in a manner that is consistent with the key findings and assumptions of the Concept Plan EA as demonstrated below.
Road Transport	
Objective: To maintain an acceptable level of performance of existing intersections and roadways in the vicinity of the site, and encourage modal split towards rail.	A Traffic Impact Assessment has been prepared to accompany this EA (Appendix D), to assess the impacts of the proposal, and recommend measure to reduce impacts to acceptable levels. This TIA demonstrates that acceptable performance criteria for the existing intersections will be met (as described below). Given the location of the end users, the proposed liquid fuels facility does not lend itself to modal spit towards rail, however consideration of rail should be undertaken if deemed viable.
Criteria: George/Ingall Street intersections with Industrial Drive: - Level of Service D - Average delay 43 – 56 seconds.	Both intersections would operate within the LOS criteria under a standalone project scenario. The industrial Drive / Ingall Street Intersection would operate at a LOS F in 2024 under a Concept Plan 'fully developed' scenario. Traffic modelling has shown that diverting traffic from Ingall to George Street where there is capacity at peak times would result in both intersections meeting LOS criteria. Peak hour truck movements would equate to two trucks (four truck movements) per hour through the intersection (Section 13.0).

Mayfield Concept Approval Submission (09_0096) Statement of Commitments Summary.	Marstel Facility Project Application (08_0130)
Criteria: Bulk Liquid truck movements per daytime peak hour: - 9 movements / peak hours (morning and afternoon).	The facility is expected to generate 22 truck movements per day (24hr). Truck movement will be spread across the day so the arriving trucks have access to a pump pad (refer Section 13.0)
Rail Transport	
Objective: To ensure rail operations have minimal impact on other rail activities within Morandoo Yard, Port Waratah Loop and Bullock Island Loop, and that rail cargo volumes are maximised within the constraints of the rail network that exist at a particular point in time.	NA. No rail movements proposed for this project.
Noise	
Objective: To ensure noise generated by operations at the site, and from road and rail traffic travelling to and from the site, does not have an adverse impact on surrounding residential receivers.	The Noise and Vibration Impact Assessment at Appendix G reviewed the existing acoustic environment and predicted impacts from the proposal.
Criteria: The overall site criteria for the 4 sensitive receivers listed in Table 11-3 of the Concept Plan EA not to be exceeded.	The Noise and Vibration Impact assessment concluded that no sensitive receivers would experience exceedences in the criteria.
Criteria: Sleep disturbance criteria listed in Table 11-4 of the Concept Plan EA not to be exceeded.	The Noise and Vibration Impact assessment concluded that no sensitive receivers would experience exceedences in the sleep disturbance criteria.
Criteria: A sound power level of 114dB(A) not to be exceeded from operations in the Bulk Liquid Precinct.	The Noise and Vibration Impact assessment concluded that sound power levels from the bulk liquids facility would not exceed the criteria.
Air Quality	
Objective: To ensure air pollutants emitted from the site do not have an adverse impact on surrounding residential receivers.	An Air Quality Impact Assessment (AQIA) was prepared to examine the air quality impacts of the proposed bulk liquids facility. Refer Appendix F.
Criteria: Overall site criteria for air pollutants is not to exceed the criteria listed in Table 11-6 of the Concept plan EA.	As assessment of the likely impacts of the proposal found that none of the concentrations for any of the pollutants would exceed the allowable thresholds as listed in Table 11-6 of the Concept Plan EA.
Hazard and Risk	
Objective: To ensure potentially hazardous areas within the site do not pose unacceptable risks to surrounding land uses and that the location of facilities within the site do not result in an accumulation of risk that would exceed the acceptable risk criteria.	The recommendations of the PHA will manage risks associated with the proposal within acceptable levels.
Criteria (overall site): Potentially hazardous facilities/areas within the site would be required to be sited with appropriate separation distances (refer to Section 11.7.3 of the Concept Plan EA) and designed such that they do not cumulatively impact adjacent surrounding industrial and residential land uses in a manner exceeding permissible impact levels published in *HIPAP No.4 Risk Criteria for Land Use Safety Planning*. Potentially hazardous facilities/areas are those used to store Dangerous Goods that are listed on the *Australian Dangerous Goods Code* and exceed the threshold levels listed in SEPP 33.	All applicable separation distances required by the proposal have been incorporated into the layout and design. The Proposed Facility will only store diesel and biodiesel. A review of SEPP33 indicated that neither of these liquids are classified as Dangerous Goods subject to SEPP 33 requirements, meaning the thresholds in SEPP 33 do not apply.

Mayfield Concept Approval Submission (09_0096) Statement of Commitments Summary.	Marstel Facility Project Application (08_0130)
Criteria (precinct): Potentially hazardous facilities/areas within each precinct would be required to be sited with appropriate separation distances (refer to Section 11.7.3 of the Concept Plan EA) and designed such that they do not impact adjacent precincts in a manner exceeding permissible impact levels published in *HIPAP No.4 Risk Criteria for Land Use Safety Planning.* Potentially hazardous facilities/areas are those used to store Dangerous Goods that are listed on the *Australian Dangerous Goods Code* and exceed the threshold levels listed in SEPP 33.	As above.
Water Management	
Objectives: - To minimise the impacts of stormwater runoff on property, infrastructure and the receiving environment. - To ensure flooding impacts within the site are minimised. - To minimise pollutants in runoff from the site and to contribute towards achieving the water quality objectives of the Hunter River.	The proposed facility has been designed to be compatible with the existing stormwater management in a manner which minimises flooding impacts and manages the release of pollutants to the Hunter River.
Criteria: Surface water management environmental performance criteria are as follows: - Stormwater is to be managed on-site and stormwater infrastructure must comply with the overall SMS prepared for the site. - There is to be no uncontrolled discharge of stormwater to the South Arm of the Hunter River.	Stormwater management systems have been developed to internally capture and manage runoff: - In a manner which is compatible with the overall stormwater management system prepared for the site. Proposed stormwater management facilities will drain to the existing stormwater management facilities. - As detailed in Section 8.0 surface water runoff will be controlled and treated.
Criteria: Flood risk management environmental performance criteria are as follows: - Finished site levels are to be greater than the level of the 1 in 100 year ARI of 1.35 metres AHD plus additional freeboard. - Main drains and minor drains are to have the capacity to convey the 1 in 100 year and 1 in 20 year ARI, respectively. - The drainage system is to have the capacity to contain the 1 in 100 ARI.	Site levels have been designed to be consistent with appropriate flood design levels as follows: - The site is at approximately 1.9m AHD. Finished site levels will be greater than 1.35m AHD and where applicable freeboard required. Evidence will be included on the detailed design plans. - Main and minor drains will be designed to 1 in 100 and 1 in 20 year ARIs respectively. - The Concept Plan area drainage systems has been designed to contain the 100 year ARI. The proposal will drain to this system, meeting this criterion.
Criteria: Water quality environmental performance criteria are as follows: - Discharges to sewer would be in accordance with Trade Waste Agreements between operators and Hunter Water. - Discharges to the South Arm of the Hunter River are to be in accordance with the requirements of EPLs and/or the ANZECC guideline trigger values for marine water at 95 percent level of protection of species.	The environmental performance criteria for water quality will be met by the proponent committing to: - Any Trade waste agreements would be entered into with Hunter Water prior to the site becoming operational. - Runoff generated from the site will be treated for hydrocarbons (through CPI/API devices) prior to leaving the site, in accordance with the requirements of any applicable EPL.

Mayfield Concept Approval Submission (09_0096) Statement of Commitments Summary.	Marstel Facility Project Application (08_0130)
Heritage and Cultural	
Environmental performance objectives and criteria have not been developed in relation to heritage and cultural issues. HDC have undertaken to address the archaeological resources in areas to be impacted by the remediation works. This includes the locations of all of the five items identified as having archaeological significance. NPC commits to: - Undertaking archaeological testing, monitoring, recording and salvage should there be impacts, such as the installation of footings and services, in those areas of archaeological potential (as identified in Section 9.7 of the Concept Plan EA) that have not been investigated by HDC. - Undertaking archaeological testing, monitoring, recording and salvage should there be impacts, such as the installation of footings and services, in the area of the No.1 and 2 Pig Mills. - Undertaking archaeological testing, monitoring, recording and salvage should excavation within the area of the Hunter River Copper Smelting works exceed two metres.	The footprint of the proposed development sits within the non-heritage area as shown on Figures 9-11 of the Concept Plan EA. In addition, no works will impact the No 1 or 2 Pig Mills, or result in any excavation in the area of the Hunter River Copper Smelting works. The proponent is committed to preserving the archaeology of the site and has made those commitments to ensure that if any archaeology is uncovered during site works appropriate actions are taken.
Infrastructure	
Local service providers have advised that there is likely to be available capacity to service the proposed concept, particularly since there are a number of significant service upgrades planned for the area. Alternatively, there is also the potential for provision of services to the site via IIP or OneSteel. Environmental performance objectives and criteria have not been developed in relation the provision of infrastructure and services to the site, however, NPC commits to: - Preparing an Infrastructure Plan for the site to identify the services required in each precinct, identify the services corridors to and within the site, detail coordination and cost sharing mechanisms for provision of services, and include protocols for installation of services etc. - Working with Project applicants regarding the provision of services to the site via services corridors in a coordinated manner, and negotiating with Project applicants on cost sharing mechanisms for provision of services. - Project applicants would be responsible for consulting with local service providers regarding demand for and provision of, services when more detailed information is available on the service requirements for each facility.	The proponent will work with NPC in a coordinated manner consistent with service provision for the entire Concept Plan area. - It is envisaged that on approval, an Infrastructure Plan for the Concept Plan area will be prepared. - Marstel will work with NPC during the preparation of this plan to identify servicing requirements and the most appropriate means of meeting these requirements without impacting service provision to and other landowners/operators in the vicinity. - Consultation with service providers by the proponent would be undertaken as part of this plan preparation.
Contamination	
Objective: To ensure development of the site is carried out in a way which would not compromise the remediation outcome as set out in the VRA No 26025 nor pose a risk to the environment or personnel.	The Project has been designed so it does not compromise any element or remediation outcome as set out in the VRA No 26025 nor pose a risk to the environment or personnel.

Mayfield Concept Approval Submission (09_0096) Statement of Commitments Summary.	Marstel Facility Project Application (08_0130)
Criteria: Project applications would be required to comply with the following environmental performance criteria: - Development would be carried out in a way which would not cause surface and/or subsurface displacement of the barrier wall. - Development would be carried out in a way that minimises disturbance of the cap wherever possible. Where it is necessary to excavate beneath the capping layer, any excavated soils would be tested for contamination and disposed of appropriately in accordance with the CSMP. - Development would be carried out in accordance with the requirements of the VRA No 26025 and the CSMP.	The project has been shown to as described below: - The subterranean barrier wall would run between the proposed diesel storage tanks, and the office and pump pad areas. Infrastructure such as the tank farm, pump pad, office and workshop will not occur directly over the barrier wall and applicable setbacks to the barrier for access have been provided in the design. - Disturbance and intrusion of the existing capping layer will be required in order to allow for the construction of the facility. This will be minimised through the use of piling if at all necessary. Any excavated soils would be tested for contamination and disposed of appropriately in accordance with the CSMP. - Development would be carried out in accordance with the approved VRA No 26025 and CSMP.
Socioeconomic	
Environmental performance objectives and criteria have not been developed in relation socioeconomics. The proposed concept would result in economic benefits to the local area and the Hunter Region. The amenity of the area would be maintained through the mitigation and management of traffic, air quality, and noise impacts which are addressed in Sections 11.3, 11.5 and 11.6 of the Concept Plan EA. In addition, NPC would be responsible for continuing to liaise with the Mayfield CCC to periodically update them on the status of development of the proposed concept and to discuss issues of concern to the community.	The proposal will result in positive economic impacts as detailed in Section 19.0 of this report. Potential impacts of the proposal on traffic, air quality and noise are addressed within this report in Sections 13.0, 9.0, and 12.0 respectively. Impacts from these have been shown to be minimal and with appropriate criteria. Through NPC, the proponent will periodically liaise with the Mayfield CCC regarding the status of the development as described in Section 5.0 of this report.
Visual	
The proposed concept would be a state-of-the-art facility and would result in a positive visual transformation of the site. Therefore, environmental performance objectives and criteria have not been developed. However, NPC would require Project applicants to prepare Lighting and Material Finishes Management Plans for the individual facilities. The plans would include requirements to minimise the potential for visual impacts such as the use of directional lighting to minimise light spill into surrounding areas during the night time and the use of suitable colours and materials for the buildings and other structures to minimise reflectivity and contrast. NPC would review the individual plans to ensure a level of consistency in the visual appearance of the individual facilities across the site.	As stated, specific visual impact criteria have not been specified however in accordance with Marstel's history of facility management the Proposal will be a state of the art and within the visual context of the wider area. Details of lighting and finishing materials will be prepared for the facility. These will include details of light emissions, colour, material, and compatibility with surrounding development. Approval of materials and finishes would be required from NPC prior to implementation.

Mayfield Concept Approval Submission (09_0096) Statement of Commitments Summary.	Marstel Facility Project Application (08_0130)
Ecology	
The proposed concept would not have an adverse impact on terrestrial flora and fauna at, or in the vicinity of, the site, and therefore, environmental performance objectives and criteria have not been developed. However, NPC would require Project applicants to prepare Landscape Management Plans for individual facilities and include a requirement to landscape appropriate areas of the site using native vegetation. It is important to note that with the exception of the landward boundary of the site, there would be very few areas at the site available for landscaping. NPC would review the individual Landscape Management Plans.	Areas available for landscaping within the Marstel Project site are limited. For safety and security reasons the use of vegetation must be limited. Vegetation will be limited to grass along the edge of access roads and screening planting along the north-eastern and eastern site boundaries, as well as the office and car parking area. A Landscape Management Plan would be prepared for the site for review by NPC.
Waste Management	
Environmental performance objectives and criteria have not been developed in relation to waste management. However, NPC would require Project applicants to prepare WMPs for the site, addressing waste management during both construction and operation. The WMPs should emphasise the potential for recovery and reuse of waste, the potential to minimise waste generation and include specific waste management requirements for waste types identified across the site consistent with the waste management strategies included in Section 9.13 of the Concept Plan EA.	Section 15.0 provides estimated waste generation rates and streams resulting from the proposal. WMPs would be prepared for the construction and operational phases and emphasise the reduction, recovery and reuse of waste where possible. This has been committed to in the SoC.
Climate Change and Sustainability	
Project applicants would be responsible for: - Incorporating sustainability strategies into the design of individual facilities. At a minimum, sustainability strategies would be required to address the use of renewable energy and energy conservation, waste reduction, reuse, and recycling, and water conservation. - Auditing energy and water consumption, and waste generation so as to monitor performance and identify areas for improvement. Auditing and performance management requirements would be included in the Sustainability Plans. - Sustainability Plans detailing sustainability goals and objectives, and sustainability strategies would be prepared by Project applicants.	As detailed in Section 24.5 the proponent is committed to strategies that address: - The use of renewable energy and energy conservation, waste reduction reuse and recycling, and water conservation. - The auditing of energy use, water consumption, waste generation and there management practices. - Sustainability strategies, goals and objectives.

23.0 Cumulative Impacts

23.1 Introduction

The Bulk Fuels Facility forms a component of the Concept Plan area. An assessment of the potential cumulative impacts of the proposed Concept Plan, in the context of the existing major projects proposed within the immediate area was undertaken and detailed in Section 9.14 of the Concept Plan EA. This cumulative impact assessment incorporated potential cumulative impacts from the following existing and proposed developments:

Existing

- GrainCorp Grain Handling Facility, Carrington.
- Port Waratah Coal Services Coal Loader, Carrington.
- Cargill Oilseed Facility, Kooragang Island.
- Orica Ammonium Nitrate Facility Upgrade, Kooragang Island.
- Manildra Park Bulk Liquid Facility, Kooragang Island.
- Pacific Carbon Coke Production, Kooragang Island.
- Blue Circle Southern Cement, Kooragang Island.
- Newcastle Coal and Infrastructure Group third coal export terminal, Kooragang Island.
- Port Waratah Coal Services Kooragang Coal Terminal Stage 3 Coal Loader, Kooragang Island.
- Koppers facility, Mayfield (Koppers berth and pipeline are located within the site).
- BHP HRRP, Mayfield (contaminated sediments from the HRRP are currently being treated at the site).
- NPC Mayfield No.4 Berth, Mayfield (located within the site).

Proposed

- Intertrade Industrial Park (IIP), adjoining the Concept Plan area to the south.

No other existing or proposed developments have been identified as potentially contributing to cumulative impacts.

The Concept Plan assessment the potential cumulative impacts of the proposal, and the above existing/proposed development across the following areas:

- Traffic and Transport
- Noise and Vibration
- Air Quality
- Hazard and Risk
- Water
- Infrastructure
- Social and Economic.

23.2 Cumulative Impact Assessment

The cumulative impacts assessment included in the Concept Plan took into consideration the impacts of a Bulk Fuels Facility with the characteristics of a facility which is approximately double the operational size of this proposal. It is considered that the cumulative impacts determined by the Concept Plan provide a conservative assessment of the potential cumulative impacts resulting from the proposal.

In relation to potential cumulative impacts on ecology, soils and geology, air quality, waste management, heritage and visual amenity anticipated cumulative impacts are considered to be minimal.

The potential for cumulative impacts to occur in relation to the IIP was identified specifically in relation to hazard and risk, water quality, the provision of infrastructure, traffic and noise. Appropriate measures to manage hazard and risk and water quality have been incorporated into the proposal as discussed by this document. As details of potential traffic and noise impacts from the IIP have not been prepared a quantitative assessment of these cumulative impacts cannot take place. It is considered however that the mitigation measures to be put in place as part of this project will minimise any potential cumulative impacts.

Beneficial socio-economic cumulative impact would follow-on from the proposal in the form of direct engagement of local businesses in support of the proposed facility. The direct spending required to construct and operate the proposed facility would support the wider local economy through the multiplier effect.

24.0 Proposed Justification

The proposed Bulk Fuel Storage Facility provides benefits to the community and industry through the provision of regular and renewable fuel supplies to the Hunter Region. The proposed Facility is well placed to meet the future fuel demands of the region. Bringing fuels closer to the end consumers and would reduce the potential environmental impacts associated with fuels that may otherwise have to be bought to the region by tanker. Environmental benefits would also result from the increased use of biofuel, offsetting the use of fossil fuels derived energy sources.

The Facility is an ideal proposal for port related facilities. It is close to existing industrial infrastructure such as wharf facilities and heavy vehicle transport routes. The Site is currently vacant modified industrial land. Therefore the proposal would use this area for beneficial use to both the community and industry.

The Proposed Project has been designed and planned to achieve the accepted international standards for similar facilities. Marstel has an unblemished record in both environmental and occupational health and safety procedures. These would be reproduced in the Port of Newcastle facility, ensuring the Proposed Project would achieve the benefits discussed in this section.

24.1 Justification

The Proposed Project would significantly alleviate some of the infrastructure demands that are currently being placed on the Hunter Region as the need for sustainable fuels grows. The NSW parliament has plans to increase the rate at which biodiesel must be provided to consumers by fuel retailers. However, the increased provision of biodiesel to consumers in the Hunter is limited by the lack of biodiesel distribution facilities, and the failure of road transport systems to convey sufficient biodiesel into the Hunter.

The increased supply of biodiesel by Marstel to the Hunter Region as an alternative to regular diesel would create a significant overall environmental benefit through decreasing transport emissions.

The Proposed Project is in keeping with the zoning of the Site at SP1 Special Activities under Three Ports SEPP as it provides for a special land use particular to the Site, maximises the efficient use of existing port-wharf infrastructure, maintains a distance between such industrial development and residential areas and promotes employment opportunities. The Site was historically an industrial area, has undergone contamination remediation and is therefore suitable only for certain industrial uses. By locating the proposed Facility on this Site, Marstel would be able to avoid the adverse impacts which would occur if the Facility was located elsewhere.

The Proposed Project is also in line with the Lower Hunter Regional Strategy as it meets the aim of appropriately allocating land to sustainably accommodate projected population growth and associated fuel demands over the next 25 years. The Proposed Project would assist a move towards sustainable fuel usage by providing the infrastructure to make this possible. This is also in line with current NSW legislation and State Government policy.

24.2 Biophysical Factors

The potential biophysical effects associated with the proposed development were assessed in Section 8.0 to Section 19.0 of this EA. The key environmental matters assessed were:

- Surface water management
- Soils
- Groundwater
- Noise
- Air quality and odour
- Waste management.

The EA provides an assessment of the biophysical impacts identified above. This EA demonstrates that the construction and operation of the proposed facility would not result in significant adverse environmental impacts to either surface water or groundwater with the implementation of appropriate safeguards. There would be no significant impacts on terrestrial ecology or issues associated with waste management. This EA concludes that the residual risk associated with these potential impacts is low, after appropriate mitigation and management measures are implemented.

The residual risk analysis undertaken for surface waters was concluded to be low/medium. A comprehensive stormwater management plan would be implemented on the Site. The operation of similar facilities with the proposed stormwater system has proved to be successful.

Air and noise impacts have both been predicted to be low, particularly with the implementation of appropriate management strategies. Impact to air quality from potential pollutants and odours has been demonstrated to be very low, with no predicted significant impacts to sensitive receivers.

The Project is therefore justifiable in terms of the biophysical elements of the environment.

24.3 Sociocultural Factors

The potential effects of the Proposed Project on social and cultural values and aspects that affect them were examined in Sections 7.0, 13.0, 14.0, 17.0, and 18.0, and included consideration of:

- Hazards and Risk
- Heritage (indigenous and non-indigenous)
- Traffic and transport
- Landscape and visual amenity.

The qualitative risk analysis conducted for the proposal has identified that the risks associated with the proposed terminal facility do not exceed the as low as reasonably possible criteria in *Applying SEPP 33 – Hazardous and Offensive Development Application Guidelines*. Residual analysis identified some aspects with a potential to impact offsite, however with the proposed measures as provided in the Statement of Commitments and these are assessed as low/medium.

The assessment presented in this EA regarding heritage, traffic and visual amenity indicates that, provided appropriate mitigation and management measures as outlined in the Statement of Commitments are implemented, the Proposed Project would have a minimal and acceptable impact on sociocultural factors. Furthermore, the Proposed Project is considered to be in accordance with planning requirements and consistent with both the current and future consumer demand for diesel and biodiesel in the region.

The Project is therefore justifiable on social and cultural grounds.

24.4 Economic

The proposed development would provide economic benefits to the local, regional and State economies. While the construction phase of the development would provide local employment opportunities and subsequent income for the Newcastle area, the operational phase would provide economic benefit to consumers in the Hunter Region through introducing greater competition in the fuel market, which is expected to result in lower fuel prices.

The Proposed Project is therefore considered to be justifiable from the economic perspective.

24.5 Ecologically Sustainable Development

Schedule 2 of the EP&A Regulation establishes four primary principles of ecologically sustainable development (ESD): the precautionary principle; intergenerational equity; biological diversity and ecological integrity; and valuation and pricing of environmental resources. The EPBC Act specifies a fifth principle for consideration, which involves decision-making processes. The application of these principles to the assessment of the Proposed Project is discussed below.

24.5.1 Precautionary Principle

The precautionary principle outlines the need to prevent environmental degradation whether a risk to the environment has been scientifically demonstrated or not. The identification of potential impacts to the environment through detailed specialist studies undertaken as part of this EA has enabled the Proposed Project to be designed to avoid significant environmental impacts, and has allowed appropriate environmental management measures to be developed to manage potential impacts so that significant adverse environmental outcomes are avoided.

24.5.2 Intergenerational Equity

The principle of intergenerational equity puts an onus on society to ensure that the health, diversity and productivity of the environment are maintained, if not enhanced, for the benefit of future generations. The Proposed Project would have minimal effect on the health of either the environment or local residents during construction and operation, as air emissions would be negligible in relation to the existing environment. As the project Site is a previously cleared portion of land, the diversity and productivity of the Site would not be adversely affected by the proposed facility. Although the Proposed Project involves the receipt, storage and distribution of fossil fuels, the proposal represents a move towards the use of more environmentally friendly fuels through the storage and distribution of biodiesel. The emissions which result from the combustion of these fuels would represent an improvement over current conditions and practices. The Proposed Project is therefore consistent with the principle of intergenerational equity.

24.5.3 Biological Diversity and Ecological Integrity

This principle requires the maintenance and conservation of a full and diverse range of plant and animal species. Section 8.0 contains an assessment of the effect of the Proposed Project on biological diversity and ecological integrity. As outlined above, the Site is a previously cleared, highly modified area that is currently devoid of any native flora and fauna. The proposed environmental management practices to be implemented during construction and operation of the facility would minimise any adverse effects on the Hunter River and harbour. As such, the Proposed Project is consistent with the principle of biological diversity and ecological integrity.

24.5.4 Valuation and Pricing of Environmental Resources

The Intergovernmental Agreement on the Environment (IGAE) and POEO Act require improved valuation, pricing and incentive mechanisms to be included in policy making and program implementation. In the context of environmental assessment and management, this would translate to environmental factors being considered in the valuation of assets and services.

Integration of environmental and economic goals is a key principle of ESD, which can be measured undertaking a cost-benefit analysis, that is, by measuring the costs of proceeding with a project against the benefits arising from the Project.

Given the different values placed on the environment, and the various components of an environment, it is difficult to assign a monetary value against the environmental costs and benefits associated with the Project. Given this, the approach adopted for this Project is the management of environmental impacts through appropriate safeguards, and to include the cost of implementing recommended safeguards in the total cost of the Proposed Project.

Relevant to the consideration of the valuation and pricing of environmental resources are the impact assessment and alternative options which have been developed during planning of the Bulk Fuel Storage Facility.

The value of the environment is also managed through legislative controls such as imposing financial penalties or requirements to rehabilitate on persons responsible for polluting or causing environmental harm.

Marstel would implement the safeguards and monitoring requirements outlined in this EA to minimise environmental impacts cause by the proposal, and to minimise the potential for pollution or environmental harm to occur.

24.6 The Objects of the *Environmental Planning and Assessment Act 1979*

This EA has been prepared as per the requirements of Part 3A of the EP&A Act. In determining an application under the transitional arrangements for the former Part 3A, it is generally accepted that the Minister will have regard to the objects of the EP&A Act. The objects of the Act are found in Section 5 and are outlined below:

a) to encourage:

- *the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages of the purpose of promoting the social and economic welfare of the community and a better environment,*
- *the promotion and co-ordination of the orderly and economic use and development of land;*
- *the protection, provision and co-ordination of communication and utility services;*

- *the provision of land for public purposes;*
- *the provision of co-ordination of community services and facilities, and*
- *the protection of the environment, including the protection and conservation of native animals and pants, including threatened species, populations and ecological communities, and their habitats, and*
- *ecologically sustainable development, and*
- *the provision and maintenance of affordable housing,*

b) to promote the sharing of the responsibility for environmental planning between the different levels of government in the State, and

c) to promote increased opportunity for public involvement and participation in environmental planning and assessment.

The Proposed Project is compatible with these objects, as it complements the current VRA No 26025 and CSMP for the former BHP Steelworks Site, and is thus in keeping with the proper management, development and conservation of the natural resources and built landscapes in the vicinity of the Site. The Facility would also potentially benefit social, economic, community and environmental welfare by providing infrastructure which is required to meet the current and predicted fuel demands of the Hunter Region. The selected location is ideal for the Proposed Project as it maximises the use of existing port infrastructure without creating a disproportionate demand on resources and utilities. There are also other potential environmental benefits from the Proposed Project, as it would facilitate the distribution of biodiesel, a renewable fuel, throughout the Hunter Region.

The Proposed Project is compatible with the Site's zoning under Three Ports SEPP. In using existing port related infrastructure to maximise efficiency, the Project promotes economic use and development of land which is currently unused. This Project Application is being run in conjunction with Project Application 09_0096 (the Mayfield Concept Approval Submission) by the applicant NPC. The Mayfield Concept Approval Submission relates to a larger area of land which would contain an array of port related facilities, and not just the Marstel Facility. Table 48 outlines the consistent approach that is being taken to the proposed Facility under this Project Application, and the proposed Facility as part of the overall Mayfield Concept Approval Submission. This Project Application is in keeping with the ordered and coordinated development of this land, as its operations have already been planned as part of the Concept Plan to develop this area.

The Proposed Project would not create an undue demand on existing communication and utility services, and would provide for the increased distribution of regular and renewable fuels in the Hunter Region.

The Site for the Proposed Project is dedicated under Three Ports SEPP as land which is to be used for the development of port related infrastructure. The Proposed Project is thus in keeping with the policy of providing certain areas of land for specific public purposes, and maximises the use of a currently unused piece of land which also provides little habitat value for native species. The proposed Project also coordinates the location of community services and facilities by placing the Facility in an area with similar surrounding land uses.

It is considered that the Proposed Project would not create significant environmental impacts for any threatened species, populations, or communities. The Site is undergoing remediation management and has been clear of flora for some time. By locating the Facility in the proposed location, the Proposed Project negates the potential environmental impact it would have at an alternative location where vegetation and habitat may be required to be cleared.

Section 24.5 outlines how the Proposed Project complements the principles of ESD. Essentially the Proposed Project would assist the Hunter Region meet its current and future energy needs with minimal environmental impact, whilst also facilitating the distribution of renewable fuels.

With the closest residential area located over 900 m away from the Site, it is not anticipated that the Proposed Project would have any impact on residential areas that could affect housing availability or pricing.

The Proposed Project was declared by the Minister on 29 May 2008 to be a Major Project to which Part 3A of the EP&A Act applies. The Minister for Planning is thus the consent authority for the Proposed Project. However, environmental assessment requirements from other relevant statutory authorities were also requested by DP&I as part of the formal consultation procedures. In parallel with this during the preparation of the EA, AECOM and Marstel consulted with relevant authorities to further discuss pertinent issues. These issues have been dealt with throughout the EA (refer Section 5.0).

Marstel also initiated contact with the community during the planning and assessment phase of this Project. Further information about this is provided in Section 5.3.

24.7 Climate Change and the Greenhouse Effect

The Greenhouse Effect is the name given to the process of altered temperatures experienced on the earth's surface as a result of the presence gases in the atmosphere that trap thermal radiation. The operation of industries and human activity throughout the world has enhanced this phenomenon by increasing the amount of greenhouse gases (GHG) in the atmosphere, and this process is considered to be a contributing factor to climate change.

The proposed development has the potential to decrease net GHG transportation emissions by locating the Marstel terminal closer to end user markets, thereby reducing the truck transportation distance required to supply fuel to service stations. Further reductions in carbon emissions would be achieved through the increase of available biodiesel products to the fuel market in the Hunter. Biodiesel may displace standard diesel products derived from fossil fuel (oil) sources thereby displacing the carbon emissions these products would produce.

The proposed facility would enable bulk fuel to be delivered to the Hunter Region via ship, rather than in part by road transportation so has the potential to reduce the number of truck movements between fuel refineries in Sydney and the consumers in the Hunter Region.

24.8 Project Sustainability

The proposal has been subject to an environmental assessment in accordance with Part 3A of the EP&A Act and the requirements issued by the Director General of the DP&I. The detailed environmental assessments that have been undertaken assessed key issues including hazard and risk, surface and groundwater, air quality and odour, noise, waste, visual impacts and traffic and transport. It was determined that there were no significant adverse impacts to the environment that could not be managed through appropriate mitigation measures, which have been reflected in the draft Statement of Commitments. It has been demonstrated that the facility is within the context of the surrounding built form and land use. The environmental assessment undertaken concluded that the proposal would have an overall low to medium residual risk after the implementation of specific mitigation measures. The environmental assessment undertaken concluded that the proposal has an overall low to medium residual risk after the implementation of specific mitigation measures.

Benefits to the community as a result of the proposal include provision of an alternative fuel supply and appropriate use of vacant industrial port side land. The facility would also assist in the reduction of greenhouse gas emissions by minimising transport of fuel to the customer and supplying fuels that comprise a percentage of fuels from renewable sources.

24.9 Consequences of Not Proceeding

The demand for fuel is increasing at local, regional and national levels. The existing fuel terminal facilities in Newcastle receive fuel via truck or pipeline from Sydney. Vehicle access from fuel facilities in Sydney is limited by route restrictions for hazardous bulk liquids, and the fuel pipeline is currently carrying capacity loads. The alternative transport route available to Newcastle facilities is via ship. The proposed location of the terminal facilities was chosen for its ready access to wharf facilities and the reduced congestion around the Newcastle area relative to alternative locations such as Sydney.

Biofuels are generated from renewable, organic sources. The use of fuels blended with biofuels can result in environmental benefits, including reduced exhaust emissions of some toxic pollutants and net reductions in greenhouse gas emissions from non-renewable sources. Increasing infrastructure capacity to store and supply such fuels would therefore contribute to improved air quality. There are also increasing legislative requirements within NSW for renewable fuels to be included as a greater percentage of the fuel mix provided by retailers. The Proposed Project would thus assist fuel retailers in the Hunter Region to meet these legislative requirements.

Other potential issues that may arise if the Proposed Project does not proceed include lack of supply of biofuels which may lead to price increases, lack of competition in the market, and less security in the fuel supply.

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25.0 Conclusion

The Proposed Project is for the construction and operation of a Bulk Fuel Storage Facility on land leased from the Newcastle Port Corporation on the former Mayfield BHP Steelworks Site in Newcastle, NSW. The proposed Facility would be used for the receipt, storage and distribution of high quality diesel and biodiesel for customers throughout the Hunter Region. The proposed Bulk Fuel Storage Facility within the Mayfield Concept Approval Site is ideally suited to the proposed location, due to its need for port access and its predicted minimal impact to the environment on remediated industrial land. The Project would create an alternative supply chain for regular and renewable fuels within the Hunter Region, and would be operated by a company that has a proven track record in environmental excellence.

The Proposed Project, operated in accordance with the Statement of Commitments, is in accordance with the principles of ecologically sustainable development and the objects of the EP&A Act. The terminal facility would provide economic benefits to the region, primarily through the introduction of greater competition, as well as stable fuel supply that would promote growth opportunities for the region. Benefits would also result from the provision of certain fuels with non-renewable origins. Relatively low levels of greenhouse gas emissions would be directly generated from the development. The development would not contribute to a decline in air quality in excess of NEPM criteria. Risks associated with the Project have been demonstrated to be below the accepted criteria for such facilities. Residents' amenity would not be significantly impacted through air, noise or traffic impacts.

This EA has fully considered the beneficial and adverse effects of the proposed Project, with full consideration of the principles of ESD as discussed above. If environmental mitigation measures outlined in this EA are implemented, it is unlikely that significant adverse impacts would occur within the area of the proposed Facility or within the surrounding environment. Therefore, no further formal environmental assessment is considered necessary.

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Appendix A

The Director-General's Requirements

Appendix A The Director-General's Requirements

Major Projects Assessment
Mining and Industry Projects
Phone: (02) 9228 6438
Fax: (02) 9228 6466
Email: nicholas.hall@planning.nsw.gov.au
Room 304
23-33 Bridge Street
GPO Box 39
SYDNEY NSW 2001

Mr T Gunning
Director/Secretary
Marstel Terminals Newcastle Pty Ltd
PO BOX 175
ALTONA VIC 3018

Dear Mr Gunning

Marstel Bulk Fuel Storage and Dispatch Facility (08_0130)
Revised Director-General's Requirements

As you are aware, the Department issued Director-General's requirements (DGRs) for the environment assessment of this project on 25 July 2008.

It is understood that Marstel wishes to proceed with the above mentioned project in a modified form. Given the time that has elapsed, I have decided to update and reissue the DGRs for the project. I have also taken the opportunity to re-consult with other Government agencies and to insert additional requirements relating to the Concept Plan application for the Port Terminal Facilities at Mayfield (09_0096) currently under consideration by the Department. The revised DGRs are attached and are based on the information you have provided to date. A copy of the agency comments received in the most recent round of consultation are also attached for your information.

Please note that these requirements may be altered at any time.

If your proposal is likely to have a significant impact on matters of National Environmental Significance, it will require an approval under the Commonwealth *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act). This approval is in addition to any approvals required under NSW legislation. It is your responsibility to contact the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) in Canberra (6274 1111 or http://www.environment.gov.au) to determine if the proposal requires an approval under the EPBC Act. The Commonwealth Government has accredited the NSW environmental assessment process, so if it is determined that an approval is required under the EPBC Act, please contact me immediately as supplementary Director-General's requirements may need to be issued.

I would appreciate it if you would contact the Department at least two weeks before you propose to submit your Environmental Assessment for the project. This will enable the Department to determine the:

- applicable fee (see Division 1A, Part 15 of the *Environmental Planning and Assessment Regulation 2000)*;
- consultation and public exhibition arrangements; and
- number of copies (hard-copy or CD-ROM) of the Environmental Assessment that will be required for exhibition purposes.

Once it receives the Environmental Assessment, the Department will review it in consultation with relevant public authorities to determine if it adequately addresses the Director-General's requirements, and may require you to revise it prior to public exhibition.

The Department is required to make all relevant information associated with the project publicly available on its website. Consequently, I would appreciate it if you would ensure that all the documents you subsequently submit to the Department are in a suitable format for the web, and arrange for an electronic version of the Environmental Assessment to be hosted on a suitable website during the exhibition period.

If you have any enquiries about these requirements, please contact Nick Hall on 9228 6438.

Yours sincerely

Marcus Ray
A/Deputy-Director General
As delegate for the Director-General

01/07/11

Director-General's Requirements

Section 75F of the *Environmental Planning and Assessment Act 1979*

Application number	08_0130
Project	Marstel Bulk Fuel Storage and Dispatch Facility
Location	Part of current Lot 33 DP 1116571
Proponent	Marstel Terminals Newcastle Pty Ltd
Date of Issue	July 2011
General Requirements	The Environmental Assessment of the project must include: • an executive summary; • a detailed description of the project, including: – the need for the project; – alternatives considered; – the likely staging of the project; – how the project would interact with other existing and approved port and industrial operations in the vicinity of the site; – plans of all building works and associated infrastructure. • a clear demonstration that the project is consistent with all environmental assessment requirements set out in the Concept Plan for the Port Facilities at Mayfield (09_0096) (if approved); • a risk assessment of the potential environmental impacts of the project, identifying the key issues for further assessment; • a detailed assessment of the key issues specified below, and any other significant issues identified in the risk assessment (see above), which includes: – a description of the existing environment, using sufficient baseline data; – an assessment of the potential impacts of all stages of the project on the environment, including any associated cumulative impacts associated with the operation of the project and any other approved or proposed port or industrial operations in the area; – a description of the measures that would be implemented to avoid, minimise, and if necessary offset the potential impacts of the project, including evidence that all relevant prevention and mitigation measures would be applied where reasonable and feasible; and – contingency plans for managing any significant risks to the environment. • a statement of commitments, outlining the proposed environmental management and monitoring measures; • a conclusion justifying the project, taking into consideration: – the suitability of the site; – the economic, social and environmental impacts of the project as a whole; and – whether the project is consistent with the objects of the *Environmental Planning and Assessment Act 1979*; • a signed statement from the author of the EA, certifying that the information contained within the document is neither false nor misleading.
Key Issues	• **Hazards and Risk** – including: – an assessment of the potential hazards and risks to adjacent port and industrial operations, people and/or the environment associated with the project; – how ecological and human health risks posed by contaminants in the context of past, existing and future land uses would be managed; and – how the project would comply with the approved remediation works and associated management measures across the former BHP Billiton steelworks site. • **Soil and Water** – including: – an assessment of impacts to remediation works, soil and stability during

	the construction and operation of the project, including the controls that would be put in place to manage erosion and sediment, stormwater and acid sulphate soil (if present); – an assessment of impacts to groundwater and surface water resources during the construction and operation of the project, including the Hunter River Estuary; • **Transport and Access** – including: – accurate predictions of the traffic generated by the project; – a detailed assessment of the potential impacts of the project on the capacity, efficiency and safety of the road and shipping networks; – details of any upgrades to road or shipping infrastructure that would be required due to the project; and – site accesses, internal roads and vehicular parking required as a result of the project; • **Noise and Vibration** – including a quantitative assessment of construction, operational and transport noise and vibration impacts to surrounding receivers from on site and off site activities (including shipping). • **Air Quality** – including a quantitative assessment of the air quality and odour impacts of the project on surrounding receivers; • **Greenhouse Gas** – including a quantitative assessment of the potential scope 1, 2 and 3 greenhouse gas emissions of the project and a qualitative assessment of the potential impacts of these emissions on the environment. • **Waste** – including accurate estimates of the quantity and classification of the potential liquid and non-liquid waste streams of the project and a description of the measures that would be implemented to ensure that any waste produced is appropriately handled, processed and disposed of.
References	While not exhaustive, the following attachment contains a list of some guidelines, policies, and plans that may be relevant to the environmental assessment of this project.
Consultation	During the preparation of the Environmental Assessment, you should consult with the relevant local, State or Commonwealth government authorities, service providers, community groups or affected landowners. In particular you must consult with: • Hunter Development Corporation; • Newcastle Port Corporation; • Newcastle City Council; • NSW Department of Primary Industries; • NSW Maritime; • NSW Office of Water; • Office of the Environment and Heritage; and • Roads and Traffic Authority. The consultation process and the issues raised must be described in the Environmental Assessment.
Deemed refusal period	60 days

Guidelines, Policies and Plans

Aspect	Policy /Methodology
Risk Assessment	
	AS/NZS 4360:2004 Risk Management (Standards Australia)
	HB 203:2006 Environmental Risk Management – Principles & Process (Standards Australia)
Hazards and Risk	
	State Environmental Planning Policy No. 33 – Hazardous and Offensive Development
	Applying SEPP 33: Hazardous And Offensive Development Application Guidelines (DUAP)
	Hazardous Industry Planning Advisory Paper No. 4 (DUAP, 1992): Criteria for Land Use Planning, (DUAP)
	Hazardous Industry Planning Advisory Paper No. 6 (HIPAP No 6): Guidelines for Hazardous Analysis, (DUAP)
	Multi-Level Risk Assessment (DUAP)
Soil and Water	
Coastal	NSW Coastal Policy (NSW Government 1997)
	State Environmental Planning Policy No 71 - Coastal Protection
	Floodplain Risk Management Guideline - Practical Consideration of Climate Change (DECC)
Surface Water	National Water Quality Management Strategy: Water quality management - an outline of the policies (ANZECC/ARMCANZ)
	National Water Quality Management Strategy: Policies and principles - a reference document (ANZECC/ARMCANZ)
	National Water Quality Management Strategy: Implementation guidelines (ANZECC/ARMCANZ)
	National Water Quality Management Strategy: Australian Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ)
	National Water Quality Management Strategy: Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC/ARMCANZ)
	Bunding and Spill Management (EPA)
	Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (DEC)
	Using the ANZECC Guideline and Water Quality Objectives in NSW (DEC)
	The NSW State Rivers and Estuaries Policy (NSW Water Resources Council)
Groundwater	National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia (ARMCANZ/ANZECC)
	NSW State Groundwater Policy Framework Document (DLWC)
	NSW State Groundwater Quality Protection Policy (DLWC)
	NSW State Groundwater Quantity Management Policy (DLWC) Draft
	The NSW State Groundwater Dependent Ecosystem Policy (DLWC)
Acid Sulfate Soils	Acid Sulfate Soil Manual (ASSMAC)
Contamination	State Environmental Planning Policy No 55 - Remediation of Land
	Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (ANZECC & NHMRC)
	National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPC)
	Managing Land Contamination - Planning Guidelines SEPP 55 – Remediation of Land (DUAP and EPA)
	Contaminated Sites: Sampling Design Guidelines (NSW EPA)
	Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites (NSW EPA)
	Guidelines for the Assessment and Management of Groundwater Contamination (DECC) Draft
Erosion and Sediment	Managing Urban Stormwater: Soils & Construction (Landcom)
	Design Manual for Soil Conservation Works - Technical Handbook No. 5 (Soil Conservation Service of NSW)
	Soil and Landscape Issues in Environmental Impact Assessment (DLWC)
	Wind Erosion - 2nd Edition (DIPNR)

Stormwater	Managing Urban Stormwater: Strategic Framework. Draft (EPA)
	Managing Urban Stormwater: Council Handbook. Draft (EPA)
	Managing Urban Stormwater: Treatment Techniques (EPA)
	Managing Urban Stormwater: Source Control. Draft (EPA)
	Managing Urban Stormwater: Harvesting and Reuse (DEC)
Wastewater	National Water Quality Management Strategy: Guidelines for Sewerage Systems - Effluent Management (ARMCANZ/ANZECC)
	National Water Quality Management Strategy: Guidelines for Sewerage Systems - Use of Reclaimed Water (ARMCANZ/ANZECC)
	National Water Quality Management Strategy - Guidelines For Water Recycling: Managing Health And Environmental Risks (Phase1) (EPHC, NRMMC & AHMC)
	National Water Quality Management Strategy - Guidelines For Water Recycling: Managing Health And Environmental Risks (Phase1) (EPHC, NRMMC & AHMC)
Transport and Access	
	State Environmental Planning Policy (Infrastructure)
	Guide to Traffic Generating Development (RTA)
	Road Design Guide (RTA)
Noise	
	NSW Industrial Noise Policy (DECC)
	NSW Road Noise Policy (OEH, 2011)
	Interim Construction Noise Guideline (DECC)
Vibration	
	Environmental Noise Management – Assessing Vibration: a technical guide (DEC)
	DIN 4150 Part 3 – Structural Vibration: effects of vibration on structures (ISO, 1999)
	Assessing Vibration – A Technical Guide 2006 (DEC)
Air Quality	
	Protection of the Environment Operations (Clean Air) Regulation 2002
	Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DEC)
	Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (DEC)
Odour	
	Technical Framework: Assessment and Management of Odour from Stationary Sources in NSW (DEC)
	Technical Notes: Assessment and Management of Odour from Stationary Sources in NSW (DEC)
Greenhouse Gas	
	National Greenhouse Accounts (NGA) Factors
	Guidelines for Energy Savings Action Plans (DEUS)
Waste	
	State Environmental Planning Policy (Infrastructure)
	Waste Avoidance and Resource Recovery Strategy 2007 - Overview (DECC)
	Waste Avoidance and Resource Recovery Performance Report 2006 (DECC)

Appendix B

Visual Impact Assessment

Appendix B Visual Impact Assessment

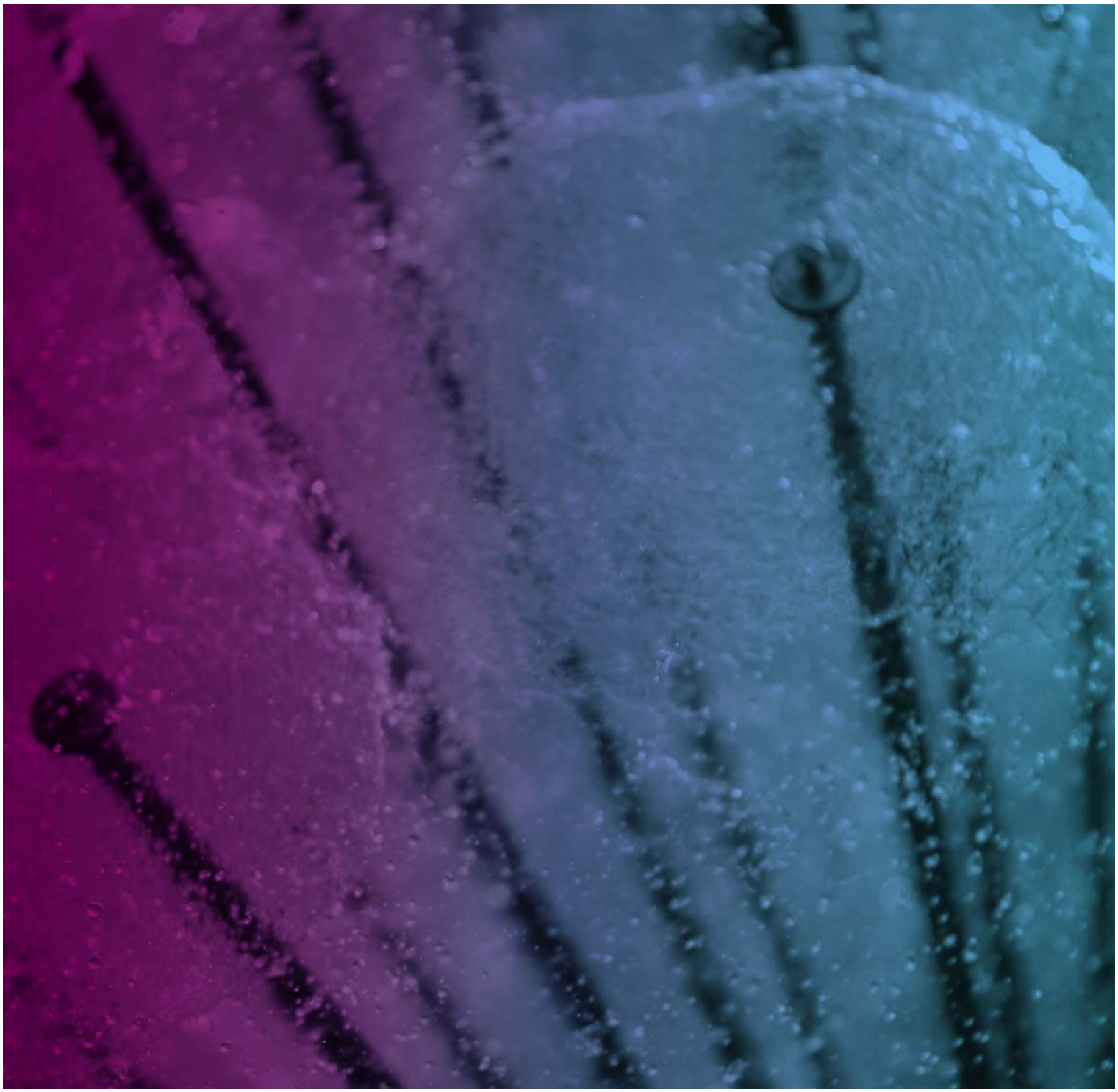
Proposed Bulk Liquids Storage Facility,
Port of Newcastle

Marstel Terminals Pty Ltd

15 May 2008

Document No. Appendix A

Visual Impact Assessment



Visual Impact Assessment

Prepared for

Marstel Terminals Pty Ltd

Prepared by

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15 May 2008

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Quality Information

Document	Visual Impact Assessment
	60161149
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Date	15 May 2008
Prepared by	Alison Dodds
Reviewed by	Catherine Brady

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
Final	15-May-2008	Final	Renae Gifford Principal Environmental Scientist	

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Table of Contents

1.0 Introduction 1
1.1 Overview 1
1.2 Methodology 1
2.0 Existing Environment 3
2.1 Site Context 3
2.2 Access 4
2.3 Site Description 4
2.4 Visual Context 4
2.5 Statutory Considerations 5
3.0 Description of Proposal 7
3.1 Operation 7
3.2 Construction 7
4.0 Visual Impact 9
4.1 Industrial Drive 9
4.1.1 Existing Environment 9
4.1.2 Visual Impact 10
4.2 Cormorant Road 10
4.2.1 Existing Environment 10
4.2.2 Visual Impact 11
4.3 Mayfield Residential Area 11
4.3.1 Existing Environment 11
4.3.2 Visual Impact 12
4.4 Hunter River 12
4.4.1 Existing Environment 12
4.4.2 Visual Impact 13
4.5 The Surrounding Industrial Area 13
4.5.1 Existing Environment 13
4.5.2 Visual Impact 13
5.0 Summary 15

List of Plates

Plate 1 View North-West toward Proposal Site from Industrial Drive (near Crebert Street) 9
Plate 2 Pedestrian View toward Proposal Site from Industrial Drive (near Crebert Street) 10
Plate 3 View toward Proposal Site from Cormorant Road 11
Plate 4 View toward Industrial Area from Crebert Street 12

List of Figures

Figure 1 Site Location 3

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1.0 Introduction

1.1 Overview

This visual impact assessment has been prepared by ENSR Australia on behalf of Marstel Terminals Newcastle Pty Ltd (Marstel) for its proposed bulk liquids storage facility (the Proposal) located in the former BHP Steelworks area, approximately five kilometres north-west of the Newcastle central business district.

1.2 Methodology

This report describes the existing environment of the Proposal site, the proposed activity, and the visual change likely to result from the Proposal. The assessment is based on the preliminary design of the Proposal as described in the *Environmental Assessment Scoping Report* for the proposal prepared by ENSR in May 2008 and site inspections undertaken during March 2008.

The visual assessment considers the following:

- Existing site conditions – vegetation, slope, surrounding development;
- The nature of proposed activities – height, scale, materials, colours;
- Views that may be obscured as a result of the proposed activity;
- The impact on the visual amenity of the surrounding area; and
- Any measures that could be undertaken to mitigate any adverse visual impacts.

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2.0 Existing Environment

This report describes the existing environment of the Proposal site, the proposed activity, and the visual change likely to result from the Proposal. The assessment is based on the preliminary design of the Proposal as described in the *Environmental Assessment Scoping Report* for the proposal prepared by ENSR in May 2008 and site inspections undertaken during March 2008.

The visual assessment considers the following:

- Existing site conditions – vegetation, slope, surrounding development;
- The nature of proposed activities – height, scale, materials, colours;
- Views that may be obscured as a result of the proposed activity;
- The impact on the visual amenity of the surrounding area; and
- Any measures that could be undertaken to mitigate any adverse visual impacts.



Figure 1 Site Location

2.1 Site Context

The area surrounding the site is home to port-associated heavy industrial activities; chemical plants, and raw product shipping and storage. The nearest residential area is Mayfield. The closest residential homes are located approximately 850 metres from the proposed terminal site. Across the other side of the Hunter River is the Kooragang Island industrial area.

The overall character in the area surrounding the site is industrial. In the vicinity there are heavy trucks using the Industrial Highway to the south; freight ships passing along the Hunter River, and loading and unloading activities occurring, and on, Kooragang Island to the north.

2.2 Access

Ship berthing facilities are located approximately 800 metres down river from the proposal site (BHP Billiton Berths).

Vehicular access to the Steelworks area is obtained from Industrial Drive. Industrial Drive is a main vehicular thoroughfare carrying heavy traffic from Newcastle's port-side industries to the Pacific and New England Highways. Currently the Steelworks area, and consequently the proposal site, is not accessible to the public with security gates located on all road entrances into the former BHP area. The Steelworks site is being cleared for redevelopment and there are two intersections being assessed for entry into the area - Ingall Street and Crebert Street (refer Figure 1). A traffic study is being undertaken to determine the preferred intersection.

2.3 Site Description

The former BHP Steelworks area is being cleared to remove all infrastructure related to the former plant, and to make the site suitable for future industrial activities. Currently there are no internal roads within the Steelworks area. Internal roads are proposed to be constructed to enable direct vehicular access to lots.

The proposed site is predominantly level with no vegetation on the site (including no grass cover at the time of the site inspection). There is a fall of approximately 0.5 metres across the site toward the Hunter River.

To the west of the site is existing industry including OneSteel and Koppers Coal Tar Products. Their operations comprise large sheds, storage facilities, security fencing, and conveyer lines. An existing railway reserve (no rail line constructed) runs along the western boundary of the proposal site, separating the site from existing industry.

There is vacant land to the north, south and east. These vacant lots are being cleared to enable future industry to be introduced into the area. An active rail line lies approximately one kilometre to the south-east, and industrial office buildings are located in close proximity to the railway line.

A pipeline easement to the north runs between the proposal site and the adjacent vacant lot on the Hunter River. The easement is owned by Newcastle Ports Corporation and contains above ground pipeline supports carrying a pipeline elevated two metres above the ground between Koppers Coal Tar Products facility and the BHP Billiton ship berthing facility downstream.

2.4 Visual Context

The industrial area is not readily accessible, physically or visually. The Steelworks area is on low-lying land adjacent the Hunter River. There are few vantage points that overlook the site.

The closest viewing locations to the site would be from existing industrial lots to the west and south-east of the site, and from industrial lots within Kooragang Island's industrial area to the north. In the future, there would also be industrial sites immediately north, east and south of the site within the Steelworks industrial area that may view the site. These neighbouring industrial lots are similarly low-lying as the proposal site.

Along Industrial Drive, land is more elevated; however, views of the site are largely obstructed owing to topography, buildings and intermittent vegetation. Industrial Drive at its closest point is approximately 800 metres from the site.

The other well-trafficked publicly accessible road from which views to the site are possible is Cormorant Road on Kooragang Island. Cormorant Road is approximately 600 metres from the site at its closest point. Views from Cormorant Road are intermittent resulting from the Coal Loaders and associated shipping which operate on the northern side of the south arm of the Hunter River.

There are few residential areas from which views to the site are possible. The closest area is Crebert Street, Mayfield. Views across the former Steelworks industrial area are only possible from the eastern section of this street.

Passing views of the site would also be possible from the Hunter River, from recreational users and tourists.

There are no other known publicly accessible sites (such as parks, playgrounds, schools) from which the site can be seen.

2.5 Statutory Considerations

Newcastle Development Control Plan (DCP) 2005 has provisions relating to visual impact that may concern the site namely Element 4.4 '*Landscaping*' and Element 7.1 '*Industrial Development'*.

Under Element 4.4 '*Landscaping', industrial development with a cost higher than $2 million is classified with a Landscape Category of '3'*. Developments within this category require a landscape plan for the site in accordance with *Newcastle City Council's Technical Manual.* The *Technical Manual* provides detailed guidelines on landscape considerations including: site character; and mounds and screening.

Objectives of Element 7.1 '*Industrial Development'* include to:

- Minimise the impact of industrial development, visual or otherwise through careful site planning; and
- Ensure that industrial development proposed in close proximity to residential areas does not have a materially detrimental effect on such areas.

Element 7.1 provides development guidelines for the design and appearance of industrial development.

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3.0 Description of Proposal

3.1 Operation

The proposal would be designed for an estimated throughput of approximately 500 million litres (megalitres, or ML) of fuel per year. It would involve construction of:

- seven bulk liquids storage tanks on the site that would receive and store fuels;
- a truck loading gantry that would enable the blending of fuel, and enable transportation of the blended fuel offsite by truck;
- site facilities such as a workshop, office, and car park;
- fire safety equipment - two fire water storage tanks, a fire pump house;
- security fencing and lighting around the perimeter of the site; and
- pipeline and wharf equipment to transfer product from ships at the nearby berthing facility.

The seven fuel tanks would be made of steel with a white exterior (to reduce the effect of evaporation). They would comprise:

- One 17 metre high, 44 metre diameter diesel storage tank;
- Two 17 metre high, 30 metre diameter unleaded petrol storage tanks;
- Three 17 metre high, 16 metre diameter ethanol/biodiesel tanks; and
- One 17 metre high, 44 metre diameter fuel oil tank.

The tank storage area would be surrounded by concrete bund walls approximately two metres high, with intermediate bunds 0.6 metres high.

There would be two fire water storage tanks each of 15 metres high. The truck loading gantry would be eight metres high. The office and amenities would have steel wall and roof cladding with colorbond finish. The workshop, truck-loading gantry, and fire pump house would all be steel framed with colorbond cladding.

Product would be transferred to the site from ships that would dock at the berthing facility. Two dedicated manifolds with flexible hoses would be constructed at the berthing facility to enable the transfer. The hoses would be handled using the ship's cranes or shore-based mobile cranes. Each product class - diesel, ULP, biofuels and fuel oil – would be delivered to the terminal facility via a dedicated pipeline to ensure product integrity and safety. The pipelines would (through agreement) use the existing above ground pipeline supports currently used by Koppers.

Trucks would enter the site via two automatic traffic gates. The gates would be located along the eastern boundary of the proposal site, off a proposed road that would be constructed within the former BHP Steelworks area. The road would connect to Industrial Drive via the preferred intersection (either Ingall Street or Crebert Street) and then travel onto the Pacific Highway or New England Highway if departing Newcastle.

The site would operate 24 hours per day for product dispatch via road. Shipping operations would be undertaken as required, which may be at any time or day of the week.

The site would have low-level, inward-directed floodlighting at night in addition to operational task lighting.

3.2 Construction

The anticipated construction period is approximately 15 months. Construction activities required for the project would include the following:

- excavation of areas for tank foundations;
- construction of reinforced concrete bund walls;
- preparation of the bund floor (excavation, backfilling with crushed rock, installation of liner, additional backfilling with crushed rock and priming/sealing);
- installation and diversion of services and infrastructure, including stormwater drainage lines;

- construction of internal roadways (excavation, compacting of road base; pouring of concrete pavement (reinforced) for main driveway;
- construction of a pipeline on existing supports to transfer materials between the berth and the storage facility; and
- construction vehicle movements.

Much of the material would be prefabricated and installed on site, particularly fuel facility components, thereby minimising the construction activities required on site.

4.0 Visual Impact

As noted, the industrial area is not readily accessible, physically or visually. The few locations from which the site can be viewed are:

- Industrial Drive;
- Cormorant Road, Kooragang Island;
- Mayfield residential area (Crebert Street);
- the Hunter River; and
- the surrounding industrial area.

4.1 Industrial Drive

4.1.1 Existing Environment

Industrial Drive is the closest readily accessible public area to the proposal site. The road separates the residential areas of Mayfield and Tighes Hill (to the south of the road), from the large industrial area that borders the Hunter River (including the former Steelworks area), north of road.

Industrial Drive is elevated above the lower lying industrial area along the Hunter River. From the road, intermittent views into the riverside industrial area are possible. However, the former Steelworks site is largely obstructed from view by existing trees and shrubs which line the road and screen views to the north. A view looking north-west along the road (Plate 1) shows the dense screen of vegetation that prevents views down to the River.



Plate 1 View North-West toward Proposal Site from Industrial Drive (near Crebert Street)



Plate 2 Pedestrian View toward Proposal Site from Industrial Drive (near Crebert Street)

However, as Plate 2 illustrates, views toward the site are through a security fence surrounding the industrial area. Further, there are shrubs and mounds in view. Overall it is difficult to discern the proposal site given its distance from the viewer.

4.1.2 Visual Impact

The proposed development at the site would add infrastructure (tanks, buildings etc) at the site. The tanks, at 17 metres high, would be taller than existing vegetation on adjacent sites (such as can be seen in Plate 2). However, the proposed pipeline would not be visible from vehicles travelling along Industrial Drive.

For pedestrians, views of the proposed development would be of structures which are compatible and fit well with the surrounding industrial context. Adjoining lots to the south and east are likely to be used for future industrial purposes including a container storage facility proposed to the east (see Figure 1). Development that would be constructed on these sites would obstruct, and possibly prevent, through views of the proposed facility from Industrial Drive.

4.2 Cormorant Road

4.2.1 Existing Environment

The land may also be viewed from Cormorant Road on Kooragang Island some 600 metres north of the site. The Hunter River separates Kooragang Island from the former Steelworks area. A view from Cormorant Road is provided at Plate 3.



Plate 3 View toward Proposal Site from Cormorant Road

Vacant land separates Cormorant Road from the Hunter River. The undeveloped proposal site is barely distinguishable from other industrial sites at this distance. Further, views from Cormorant Road to the site are transient (obtained from moving vehicles).

4.2.2 Visual Impact

The proposed 17 metre high tanks would be located (at their closest), approximately 100 metres from the southern bank of the Hunter River. The height of existing buildings in the background of the proposal site would help the facility integrate with surrounding industrial infrastructure when viewed from Cormorant Road. There is also likely to be future development east of the proposal site (proposed container storage) which would ensure further visual absorption of the proposed facility.

Future industrial development on the vacant site between the proposal site and the Hunter River may completely obstruct direct views of the proposed tanks from Cormorant Road. Future industrial development along Cormorant Road (between Cormorant Road and the Hunter River) would also obstruct views of the proposal site, and may potentially prevent through views to the former BHP Steelworks area.

4.3 Mayfield Residential Area

4.3.1 Existing Environment

Residential areas are the most sensitive to visual changes. There are few residential areas from which views to the Hunter River industrial area are possible. Only the eastern extent of Crebert Street, Mayfield, has viewing access into the former Steelworks area.



Plate 4 View toward Industrial Area from Crebert Street

Plate 4 shows a view toward the industrial area from the nearest residential street – Crebert Street. As can be seen in the Plate, due to the elevation of the residential area, direct views into the proposal site and surrounding industrial land next to the Hunter River are not possible. Further, trees and shrubs screen views north of Industrial Drive.

As can be seen from Plate 4, where there are gaps in the vegetation, views to existing industries on Kooragang Island can be seen in the distance.

4.3.2 Visual Impact

The proposed storage tanks, truck loading gantry, and fire storage water tanks at the proposal site would not be visible from homes in the residential area. Topography, vegetation and built structures screen views to the site.

As noted in **Section 2.3**, however, Crebert Street is being considered as a possible vehicular entrance into the Steelworks industrial area. An entrance at this location may involve removal of existing vegetation and changes to topography. However, given the location of the possible entrance in relation to the proposal site, the proposal site would remain out of view from the residential area.

4.4 Hunter River

4.4.1 Existing Environment

Transitory views toward the proposal site would be possible from the Hunter River. The river is used by recreational users and tourists for fishing and boating, and by those who work in the port and on ships. There are also tourist/entertainment boats cruising on the river which may travel near the proposed site.

People seeing the site from the Hunter River would have temporary views given they are usually on moving craft, or stationed short-term in a location where the site is visible. Views south toward the site from the river would be of the cleared Steelworks area surrounded by industrial infrastructure. Views north from the river would be of heavy industry and port activity associated with Kooragang Island.

Currently there are navigation restrictions that apply to the navigable waters between the Kooragang Island Coal Terminal and the Kooragang Island Wind Generator due to dredging of the new coal loader. The restrictions may affect the normal load of recreational traffic that uses this stretch of the Hunter River. However, the restrictions are temporary and are anticipated to be lifted around December 2008.

4.4.2 Visual Impact

Vessels would be able to navigate quite close to the southern bank of the river. The proposed storage tanks at 17 metres would likely be seen at close proximity. Future development, however, that may be located east of the proposal site (container storage), and north of the proposal site (between the proposal site and the river), would obstruct direct views of the tanks and other terminal facilities.

The pipeline running along the Hunter River may be visible. Fixtures proposed at the ship berthing facility would be visible.

Although people using the Hunter River can travel in close proximity to the proposed site, and may see some, or all of the proposed development, views are transitory. The proposal site is part of an industrial area, and in this part of the river, the industrial landscape forms the visual backdrop to the river's boating and entertainment activities. The proposed site would not be a focal point, but comprise part of, and be in keeping with, the industrial context of the area.

4.5 The Surrounding Industrial Area

4.5.1 Existing Environment

The closest viewing locations to the site are from neighbouring industrial sites (existing and proposed) within the Steelworks industrial area, east and west of the site. The proposal site is also seen from industrial lots on Kooragang Island's industrial area.

4.5.2 Visual Impact

The proposed development would be of an industry similar in nature and scale to surrounding industry within the industrial area that flanks the Hunter River.

Existing industrial buildings prevent through views from the west to the site. From the south-east, existing industrial buildings and publicly accessible roads are located approximately one kilometre away and are too distant to clearly distinguish the site from the background of existing industrial infrastructure. Future redevelopment of the Steelworks site would prevent views from south-east locations to the site.

Neighbouring industrial users are not considered to be sensitive to the proposal's visual impact. Existing and proposed industrial residents form part of the industrial landscape of the area.

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5.0 Summary

The proposal site is within an existing industrial area zoned for industry and port activities. The site was part of the former BHP Steelworks area. The area is currently being cleared to provide for future industrial uses. There is no existing vegetation on the site. Existing industrial buildings are adjacent the site to the west, and approximately one kilometre to the south-east.

The proposed activities would introduce 17 metre high storage tanks, a pipeline (which would connect nearby berthing facilities to the terminal facility), and associated terminal facilities to a location approximately 100 metres from the southern shore of the Hunter River.

The view of the proposed development would be compatible with the surrounding industrial development along the Hunter River, and is consistent with the nature of the port infrastructure. The appearance of the proposed project would fit well with the existing industrial landscape of the area. The proposed site is located in an area that is not easily visible from public view corridors.

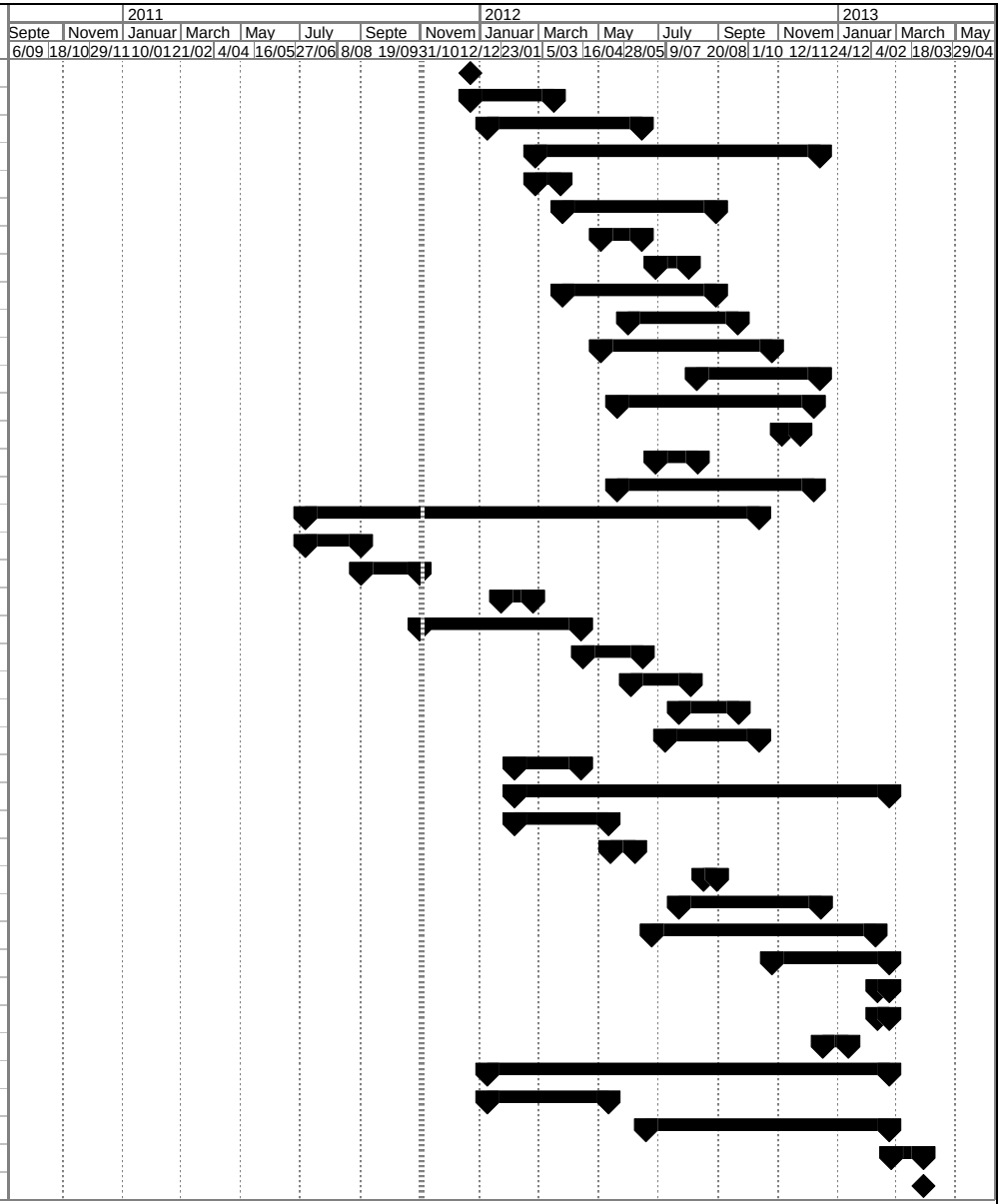
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Appendix C

Proposed Construction Timeline

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ID	ID	Task Name	Duration	Start	Finish	Resources
1	**1**	**Development Approval**	**0 days**	**Fri 23/12/11**	**Fri 23/12/11**	
2	**2**	**Establishment**	**51 days?**	**Fri 23/12/11**	**Fri 16/03/12**	
11	**11**	**Earthworks**	**114 days**	**Mon 9/01/12**	**Thu 14/06/12**	
17	**17**	**Civils**	**209 days**	**Mon 27/02/12**	**Thu 13/12/12**	
18	**18**	**Appoint and mobilise**	**20 days**	**Mon 27/02/12**	**Fri 23/03/12**	
21	**21**	**Sub Grade Works**	**113 days**	**Mon 26/03/12**	**Wed 29/08/12**	
22	**22**	**Drainage**	**30 days**	**Fri 4/05/12**	**Thu 14/06/12**	
29	**29**	**Footings**	**24 days**	**Fri 29/06/12**	**Wed 1/08/12**	
35	**35**	**Foundations, slabs & pipe bridge**	**113 days**	**Mon 26/03/12**	**Wed 29/08/12**	
45	**45**	**Buildings**	**80 days**	**Fri 1/06/12**	**Thu 20/09/12**	
49	**49**	**Bund Walls (Civil Stage 3)**	**125 days**	**Fri 4/05/12**	**Thu 25/10/12**	
70	**70**	**Pavements**	**90 days**	**Fri 10/08/12**	**Thu 13/12/12**	
79	**79**	**Structures**	**145 days**	**Mon 21/05/12**	**Fri 7/12/12**	
80	**80**	**Stairs and Platforms**	**15 days**	**Mon 5/11/12**	**Fri 23/11/12**	
84	**84**	**Structural steel**	**31 days**	**Fri 29/06/12**	**Fri 10/08/12**	
87	**87**	**Pipe Supports and Cladding**	**145 days**	**Mon 21/05/12**	**Fri 7/12/12**	
91	**91**	**Tanks**	**322 days?**	**Thu 7/07/11**	**Fri 12/10/12**	
92	**92**	**Design**	**41 days?**	**Thu 7/07/11**	**Thu 1/09/11**	
98	**98**	**Approvals**	**42 days**	**Fri 2/09/11**	**Mon 31/10/11**	
101	**101**	**Award and Mobilisation**	**25 days**	**Mon 23/01/12**	**Fri 24/02/12**	
104	**104**	**Prepare site & transport infrastructure**	**109 days**	**Tue 1/11/11**	**Fri 13/04/12**	
108	**108**	**Relocate and Refurbish NN1**	**45 days**	**Mon 16/04/12**	**Fri 15/06/12**	
111	**111**	**Relocate and Refurbish NN2**	**45 days**	**Mon 4/06/12**	**Fri 3/08/12**	
114	**114**	**Relocate and refurbish NN3**	**45 days**	**Mon 23/07/12**	**Fri 21/09/12**	
117	**117**	**Tank Site erection**	**70 days**	**Mon 9/07/12**	**Fri 12/10/12**	
133	**133**	**Electrical Equipment Supply**	**50 days**	**Mon 6/02/12**	**Fri 13/04/12**	
135	**135**	**Electrical**	**275 days**	**Mon 6/02/12**	**Fri 22/02/13**	
136	**136**	**Award and Mobilisation**	**70 days**	**Mon 6/02/12**	**Fri 11/05/12**	
140	**140**	**HV Works**	**19 days**	**Mon 14/05/12**	**Thu 7/06/12**	
144	**144**	**MCC**	**10 days**	**Fri 17/08/12**	**Thu 30/08/12**	
146	**146**	**Earthing**	**105 days**	**Mon 23/07/12**	**Fri 14/12/12**	
149	**149**	**Run power to plant**	**165 days**	**Mon 25/06/12**	**Fri 8/02/13**	
156	**156**	**Install Light and Power**	**86 days**	**Fri 26/10/12**	**Fri 22/02/13**	
160	**160**	**Fire and Security**	**10 days**	**Mon 11/02/13**	**Fri 22/02/13**	
164	**164**	**Controls**	**10 days**	**Mon 11/02/13**	**Fri 22/02/13**	
166	**166**	**Heat Tracing**	**20 days**	**Mon 17/12/12**	**Fri 11/01/13**	
168	**168**	**Mechanical**	**295 days**	**Mon 9/01/12**	**Fri 22/02/13**	
169	**169**	**Award, Mobilisation and Procurement**	**90 days**	**Mon 9/01/12**	**Fri 11/05/12**	
174	**174**	**Site installation**	**179 days**	**Tue 19/06/12**	**Fri 22/02/13**	
189	**189**	**Commissioning**	**25 days**	**Mon 25/02/13**	**Fri 29/03/13**	
191	**191**	**Substantially complete**	**0 days**	**Fri 29/03/13**	**Fri 29/03/13**	



Project: mayfield construction timeline
Date: Thu 3/11/11

Task	Milestone	Rolled Up Critical Task	Split	Group By Summary	
Critical Task	Summary	Rolled Up Milestone	External Tasks	Deadline	
Progress	Rolled Up Task	Rolled Up Progress	Project Summary		

Appendix C Proposed Construction Timeline

Appendix D

Transport Assessment

Appendix D Transport Assessment

AECOM

Transport Assessment

Mayfield Site Port-Related Activities Concept Plan



Transport Assessment

Mayfield Site Port-Related Activities Concept Plan

Prepared for

Newcastle Port Corporation

Prepared by

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Contents

1.0 Introduction 1
2.0 Existing Transport Conditions and Capacity 3
2.1 Road Network 3
2.1.1 Strategic Road Network 3
2.1.2 Local Road Network 3
2.1.3 Traffic Volumes 5
2.1.4 Intersection Performance 7
2.2 Rail Network 10
2.2.1 Description and Capacity of Infrastructure 10
3.0 Future Transport Conditions and Capacity 15
3.1 Road Network 15
3.1.1 Intersection Performance 15
4.0 Transport Implications of Development Options 19
4.1 Introduction 19
4.2 Precinct Development Potential 19
4.3 Proposed Initial Operations (2024) 23
4.3.1 Precinct Trade Forecast and Likely Landside Modal Split 23
4.3.2 Road Network 24
4.3.3 Rail Network 32
4.4 Proposed Final Operations (2034) 38
4.4.1 Precinct Trade Forecast and Likely Landside Modal Split 38
4.4.2 Broader Road Network Impact Analysis 44
4.4.3 Local Road Network Impact Analysis 45
4.4.4 Impact on Road Network Due to Rail Crossing Closure 46
4.4.5 Rail Network 48
5.0 Summary and Conclusions 49
5.1 Introduction 49
5.2 Road Network Impacts 49
5.2.1 Operational Traffic 49
5.2.2 Construction Traffic 52
5.3 Rail Network Impacts 52
5.4 Conclusion 53

List of Tables

Table 2-1: Historical Traffic Volumes and Growth 5
Table 2-2: Level of Service and Average Delay Performance Criteria for Intersections 7
Table 2-3: 2008 AM Peak Hour Base Case Intersection Performance (Industrial Drive / George Street) 7
Table 2-4: 2008 PM Peak Hour Base Case Intersection Performance (Industrial Drive / George Street) 8
Table 2-5: 2008 AM Peak Hour Base Case Intersection Performance (Industrial Drive / Ingall Street) 9
Table 2-6: 2008 PM Peak Hour Base Case Intersection Performance (Industrial Drive / Ingall Street)) 9
Table 3-1: 2024 AM Peak Intersection Performance, Industrial Drive / George Street – without development 15
Table 3-2: 2024 PM Peak Intersection Performance, Industrial Drive / George Street – without development 15
Table 3-3: 2034 AM Peak Intersection Performance, Industrial Drive / George Street – without development 16
Table 3-4: 2034 PM Peak Intersection Performance, Industrial Drive / George Street – without development 16
Table 3-5: 2024 AM Peak Intersection Performance, Industrial Drive / Ingall Street 16
Table 3-6: 2024 PM Peak Intersection Performance, Industrial Drive / Ingall Street 17
Table 3-7: 2034 AM Peak Intersection Performance, Industrial Drive / Ingall Street 17
Table 3-8: 2034 PM Peak Intersection Performance, Industrial Drive / Ingall Street 17
Table 4-1: Precinct Development Potential 19
Table 4-2: Proposed Initial Operations (2024) 23
Table 4-3: Average Loading Assumptions 24
Table 4-4: Proposed Initial Operations (2024) Truck Movement Scenarios 25
Table 4-5: Proposed Initial Operations (2024) Employee Movements 25
Table 4-6: 2024 AM Peak Hour Development Trips – Industrial Drive / Ingall Street Intersection 26
Table 4-7: 2024 PM Peak Hour Development Trips – Industrial Drive / Ingall Street Intersection 26
Table 4-8: 2024 AM Peak Hour Development Trips – Industrial Drive / George Street Intersection 27
Table 4-9:2024 PM Peak Hour Development Trips – Industrial Drive / George Street Intersection 27
Table 4-10: 2024 AM Peak Intersection Performance, Industrial Drive / George Street – with development traffic 29
Table 4-11: 2024 PM Peak Intersection Performance, Industrial Drive / George Street – with development traffic 29
Table 4-12: 2024 AM Peak Intersection Performance, Industrial Drive / George Street – with development traffic and link road 30
Table 4-13: 2024 PM Peak Intersection Performance, Industrial Drive / George Street – with development traffic and link road 30
Table 4-14: 2024 AM Peak Intersection Performance, Industrial Drive / Ingall Street – with development traffic 30
Table 4-15: 2024 PM Peak Intersection Performance, Industrial Drive / Ingall Street – with development traffic 31
Table 4-16: 2024 AM Peak Intersection Performance, Industrial Drive / Ingall Street – with development traffic and link road 31
Table 4-17: 2024 PM Peak Intersection Performance, Industrial Drive / Ingall Street – with development traffic and link road 31
Table 4-18: 2024 Rail Mode Share Sensitivity Testing 37
Table 4-19: Proposed Final Operations (2034) 38

Table 4-20: Proposed Final Operations (2034) Truck Movement Scenarios 39
Table 4-21: Proposed Final Operations (2034) Employee Vehicle Movements 40
Table 4-22: 2034 AM Peak Hour Development Trips – Industrial Drive / Ingall Street Intersection – with link road 40
Table 4-23: 2034 PM Peak Hour Development Trips – Industrial Drive / Ingall Street Intersection – with link road 40
Table 4-24: 2034 AM Peak Hour Development Trips – Industrial Drive / George Street Intersection – with link road 40
Table 4-25: 2034 PM Peak Hour Development Trips – Industrial Drive / George Street Intersection – with link road 41
Table 4-26: 2034 AM Peak Intersection Performance, Industrial Drive / George Street – with development traffic and link road 42
Table 4-27: 2034 PM Peak Intersection Performance, Industrial Drive / George Street – with development traffic and link road 42
Table 4-28: 2034 AM Peak Intersection Performance, Industrial Drive / Ingall Street – with development traffic and link road 42
Table 4-29: 2034 PM Peak Intersection Performance, Industrial Drive / Ingall Street – with development traffic and link road 43
Table 4-30: 2034 PM Peak Intersection Performance, Industrial Drive / George Street – with link road and employee traffic diversion 43
Table 4-31: 2034 PM Peak Intersection Performance, Industrial Drive / Ingall Street – with link road and employee traffic diversion 43
Table 4-32: Development Traffic Movements as a Proportion of 2034 AADT 45
Table 4-33: Rail Crossing Queue Lengths 47
Table 4-34: 2034 Rail Mode Share Sensitivity Testing 48
Table 5-1: Truck and Car Movements per Precinct 49
Table 5-2: Industrial Drive / George Street Intersection – Scenario Analysis 50
Table 5-3: Industrial Drive / Ingall Street Intersection – Scenario Analysis 51

List of Figures

Figure 1-1: Proposed Site for Redevelopment 1
Figure 2-1: Intersection Locations 4
Figure 2-2: 2008 Intersection Movements – AM Peak Period 6
Figure 2-3: 2008 Intersection Movements – PM Peak Period 6
Figure 2-4: Industrial Drive / George Street Schematic Layout 8
Figure 2-5: Industrial Drive / Ingall Street Schematic Layout 10
Figure 2-6: Rail Network Diagram 13
Figure 4-1: Proposed Redevelopment Concept Plan 21
Figure 4-2: 2024 Peak Hour Development Traffic 28
Figure 4-3: Potential Train Movements 35
Figure 4-4: 2034 Peak Hour Development Trips – with link road 41
Figure 4-5: Broader Road Network Locations 44
Figure 4-6: Rail Crossing and Distance from Intersections 47

1.0 Introduction

AECOM has been engaged to provide transport input into an Environmental Assessment (EA) of the Concept Plan for the proposed redevelopment of land in Mayfield, Newcastle (proposed concept). The proposed concept is being undertaken by Newcastle Port Corporation (NPC) and it is understood that the proposed concept will facilitate upgraded port-related activities over the next 25 years. The purpose of the EA is to anticipate environmental impacts that future developments may generate, and suggest mitigation measures, if necessary.

Concept approval for the proposed concept is sought to ensure a coordinated and environmentally sustainable approach to the proposed concept that will provide a level of certainty and a framework for future development. The purpose of the proposed concept is to assist in the achievement of several state and regional objectives and initiatives formulated to provide a secure major port use in the future.

The transport input into the EA consists of:

- A review of the existing road and rail conditions and the available capacity for the proposed concept;
- An evaluation of potential impacts from predicted future development scenarios (initial [2024] and final [2034]); and
- The development of criteria for future development of the proposed concept and potential mitigation measures to be adopted.

As part of the EA process, the impact of construction traffic would normally be assessed. However, in this case, as the exact nature of the infrastructure to be constructed on site and hence the future construction methods are unknown, this aspect of the EA will be dealt with as part of the future Project applications for the construction and operation of the five land-based precincts, when these are made by the prospective operators of the facilities.

The site is located along the South Arm of the Hunter River, within the Newcastle Local Government Area (LGA), 7 km northwest of Newcastle (see **Figure 1-1**).



Figure 1-1: Proposed Site for Redevelopment

Source: AECOM, 2010

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2.0 Existing Transport Conditions and Capacity

This section provides an overview of the current road and rail network surrounding the site, as well as the existing capacity of the main access points into the site. Modelling results which review the current performance of existing road intersections are also presented.

2.1 Road Network

2.1.1 Strategic Road Network

F3 (Sydney – Newcastle Freeway)

The F3 Freeway is a 127km motorway linking Sydney to the Central Coast, Newcastle and Hunter Regions. The freeway alternates between 2 and 3 lanes in each direction for its length. The northern section of the freeway in the vicinity of the site, from north of Wyong to its terminus at John Renshaw Drive, has 2 lanes in each direction. The freeway has a speed limit varying between 80 and 110km/h.

Pacific Highway

The Pacific Highway is a 1,025km major transport route which links Sydney and Brisbane along the east coast of Australia. The section of the Pacific Highway in the vicinity of Mayfield has 2 lanes in each direction and a speed limit that varies between 60km/h and 80km/h. The Hexham Bridge carries the Pacific Highway over the Hunter River and has 2 lanes in the southbound direction and 3 lanes in the northbound direction. Currently, the section of road between the F3 Freeway and the Raymond Terrace bypass (12.2km) is being upgraded from a single carriageway to a dual carriageway to improve safety and relieve traffic congestion.

New England Highway

The New England Highway connects to the Pacific Highway at Hexham and travels west towards Maitland. It is an alternative inland route to the Pacific Highway travelling between Sydney and Brisbane. The majority of the route is single carriageway; however, between Hexham and Maitland, it has 2 lanes in each direction. For most of its length the New England Highway has a 100km/h speed limit.

Cormorant Road

Cormorant Road is located on Kooragang Island, the site of a deep water port for the export of coal, and a major heavy industry area in the Newcastle area. Cormorant Road is a sealed road that predominantly consists of one lane in each direction; the eastern section of the road widening into a dual carriageway in each direction. There is a speed limit of 60km/hr in the westbound direction and 80km/hr in the eastbound direction.

Tourle Street

Tourle Street is the continuation of Cormorant Road over the South Arm of the Hunter River to the southern mainland. Tourle Street provides a direct route between Newcastle, the industrial area and Newcastle Port facilities on Kooragang Island. The new Tourle Street Bridge opened in May 2009, and consists of one lane in each direction, with 2m shoulders. Tourle Street has a speed limit of 60km/hr in both directions.

2.1.2 Local Road Network

The proposed concept is located on an existing industrial area on the South Arm of the Hunter River. The northern portion of the site is connected to the regional road network through Industrial Drive (via Ingall Street or Bull Street); while the southern portion of the site is connected to Industrial Drive via Selwyn Street and George Street (see **Figure 2-1**).

Industrial Drive

Industrial Drive is a major four lane divided, classified road providing connections to the Pacific Highway, site, and to the north bank of the South Arm of the Hunter River. It is used as a major link between Maitland and Newcastle CBD providing access to the Honeysuckle Precinct and is the preferred alternative to the Pacific Highway for southbound traffic. It is a B-Double approved vehicle route signed at 80km/h and operates as a public transport corridor for Bus Routes 104 and 118.

Ingall Street

Ingall Street currently provides access to the north of the site from Industrial Drive, terminating at a security gate. To the south of Industrial Drive, it is an undivided, two lane, two-way collector road connecting Industrial Drive to the Pacific Highway through a predominantly residential area. It is sign posted at 50km/h and 40km/h to the north and south of Industrial Drive respectively. There are slight cracks present on the road surface of Ingall Street making it uneven in places.

Bull Street

Bull Street is a one-way slip road off Industrial Drive for eastbound traffic. It joins Ingall Street at a T-junction and is signed at 50km/h. It has large cracks and an uneven road surface along most of its length.

George Street/Selwyn Street

To the west of Industrial Drive, George Street is a four lane road with two traffic lanes and two parking lanes. It is signed at 50km/h and runs through a residential area in Mayfield East. To the east of Industrial Drive, George Street connects immediately to Selwyn Street, which runs adjacent to the rail line to the south of the site, and provides access to the site. The section of Selwyn Street giving access to the site has an uneven road surface with cracks forming in places.



Figure 2-1: Intersection Locations

Source: AECOM (adapted from Google Maps), 2010

2.1.3 Traffic Volumes

Daily Traffic Counts

RTA traffic volume data has been obtained to determine the historical traffic growth and current mid-block traffic flows in the surrounding study area. **Table 2-1** shows historical Average Annual Daily Traffic (AADT) volumes at two stations in the vicinity of the site. Both stations are located on Industrial Drive to the west of the site.

Table 2-1: Historical Traffic Volumes and Growth

Station Number	Location	1995	1998	2001	2004	Growth (%)
05.953	Industrial Drive, (NW of Woodstock Street)	29,746	29,549	30,334	30,717	0.36
05.979	Industrial Drive, (West of Werribi Street)	22,952	21,608	21,559	23,339	0.19

Source: RTA Traffic Volume Data

The data shows that between 1995 and 2004, there has been an average yearly growth rate of 0.27% in the surrounding area.

AM and PM Peak Intersection Counts

In 2008, NPC commissioned Mark Waugh Pty Ltd to undertake Traffic Impact Statements (TIS) associated with the Industrial Development at Mayfield. These were undertaken in relation to the following:

- Proposed Bulk Liquid Storage Depot[1] – located in the north west portion of the site; and
- Proposed Industrial Site[2] – located to the south of the site.

As part of these impact statements, traffic count data was collected at the two key intersections providing access to the site from Industrial Drive, namely:

- Industrial Drive / Ingall Street; and
- Industrial Drive / George Street.

Based on these reports, the AM peak and PM peak periods occur between the hours of 7.30am – 8.30am and 4.45pm – 5.45pm respectively. Intersection turning movements for the AM peak and PM peak periods at these locations are illustrated in **Figure 2-2** and **Figure 2-3**. The figures show the number of Light Vehicles (LV) and the percentage of Heavy Goods Vehicles (HGV) on each movement.

[1] *Proposed Bulk Liquid Storage Depot, Mayfield North, NSW*, Mark Waugh Pty Ltd, Sept 2008

[2] *Proposed Interim Port Side Industrial Development, Selwyn Street, Mayfield, NSW*, Mark Waugh Pty Ltd, June 2008

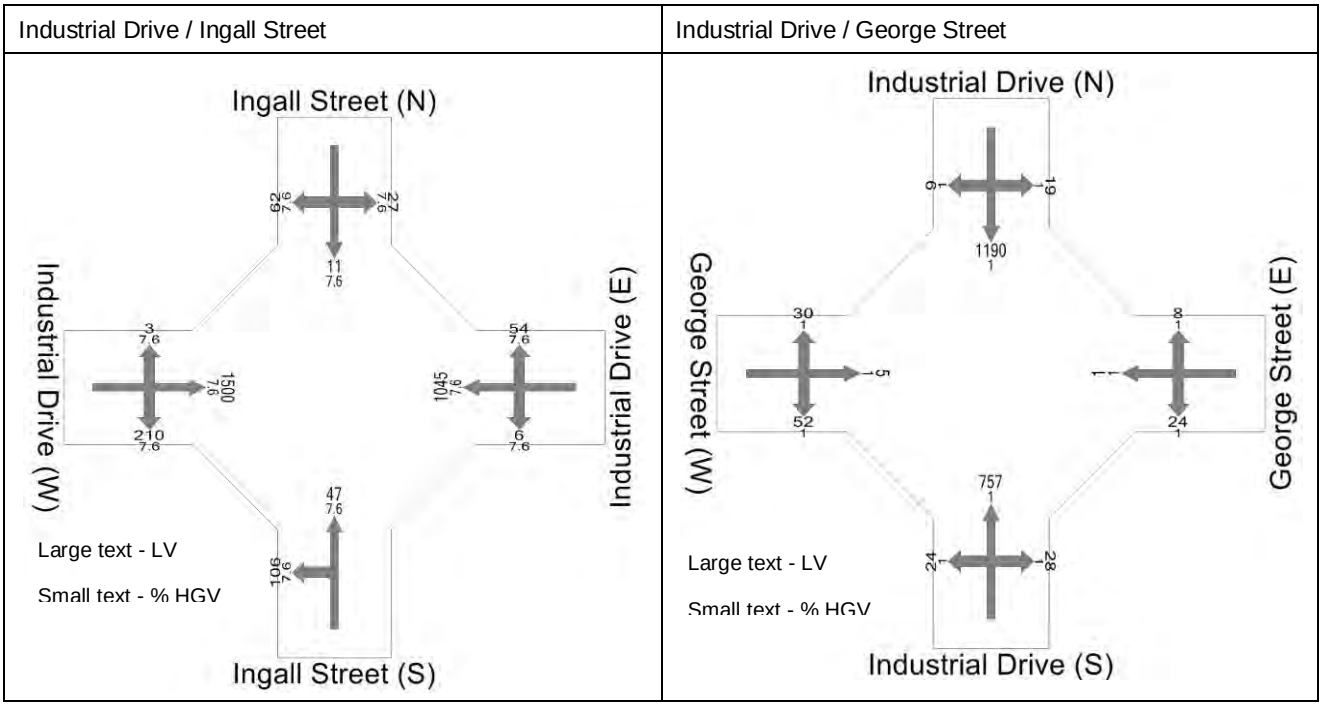


Figure 2-2: 2008 Intersection Movements – AM Peak Period

Source: Mark Waugh Pty Ltd, 2009

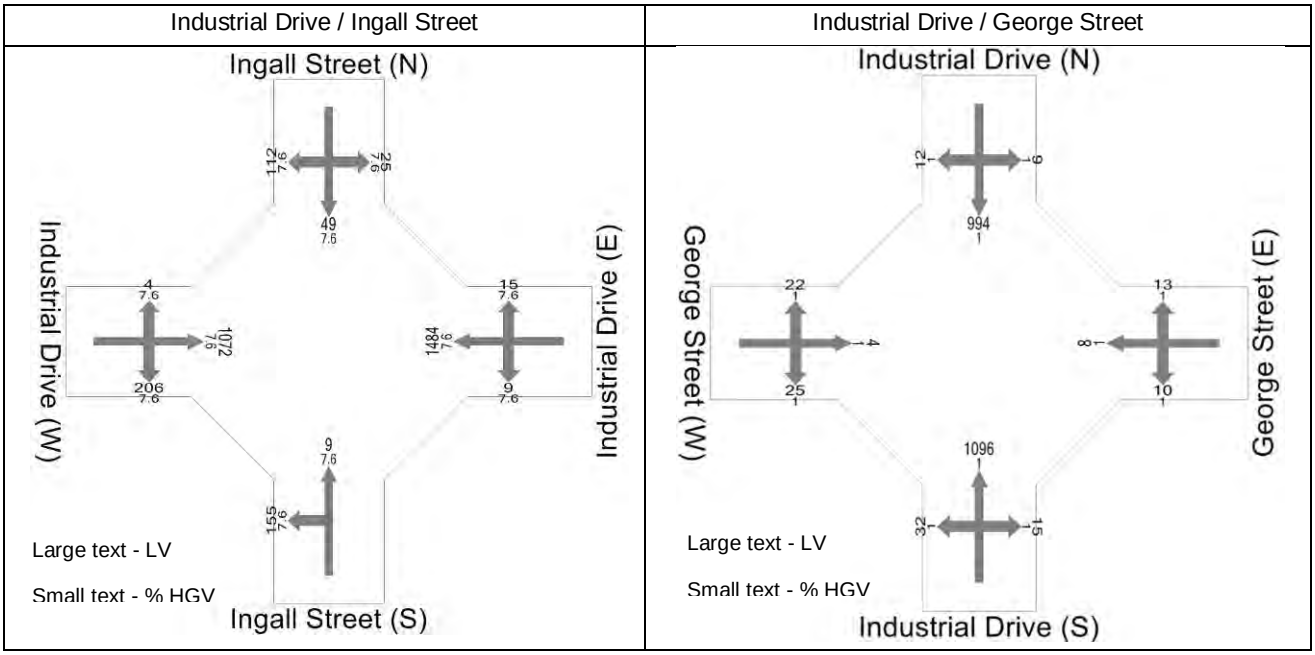


Figure 2-3: 2008 Intersection Movements – PM Peak Period

Source: Mark Waugh Pty Ltd, 2009

2.1.4 Intersection Performance

Intersection performance assessments have been evaluated using SIDRA Intersection 3.2, a computer based modelling package designed for calculating isolated intersection performance.

The main performance indicators for SIDRA Intersection 3.2 include:

- **Degree of Saturation (DoS)** – a measure of the ratio between traffic volumes and capacity of the intersection is used to measure the performance of isolated intersections. As DoS approaches 1.0, both queue length and delays increase rapidly;
- **Average Delay** – duration, in seconds, of the average vehicle waiting at an intersection; and
- **Level of Service (LOS)** – a measure of the overall performance of the intersection (this is explained further in **Table 2-2**).

Table 2-2: Level of Service and Average Delay Performance Criteria for Intersections

Level of Service	Average Delay (secs/veh)	Traffic Signals and Roundabouts	Give Way and Stop Signs
A	<14	Good Operation	Good Operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity; at signals incidents will cause excessive delays	At capacity; requires other control mode
F	>70	Roundabouts require other control mode	At capacity; requires other control mode

Source: Guide to Traffic Generating Developments, RTA, 2002

Industrial Drive / George Street

The intersection of Industrial Drive and George Street is a signalised intersection with a pedestrian crossing on the northern leg. All turning movements are permitted. The schematic layout is illustrated in **Figure 2-4**, while **Table 2-3** and **Table 2-4** summarise the intersection performance based on the 2008 traffic flows for the AM and PM peak hours.

Table 2-3: 2008 AM Peak Hour Base Case Intersection Performance (Industrial Drive / George Street)

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Industrial Drive (S Leg)	810	B	0.475	18.0	93
George St (E)	34	B	0.036	27.4	7
Industrial Drive (N Leg)	1,219	B	0.722	19.8	151
George St (W)	89	C	0.140	34.4	17
All Vehicles	**2,152**	**B**	**0.722**	**19.9**	**151**

Source: AECOM, 2010

Table 2-4: 2008 PM Peak Hour Base Case Intersection Performance (Industrial Drive / George Street)

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Industrial Drive (S Leg)	1,145	B	0.748	23.5	154
George St (E)	32	B	0.029	28.3	5
Industrial Drive (N Leg)	1,016	B	0.658	20.9	128
George St (W)	51	C	0.065	31.4	9
All Vehicles	**2,244**	**B**	**0.748**	**22.6**	**154**

Source: AECOM, 2010

The intersection of Industrial Drive / George Street is shown to operate within capacity during the AM and PM peak and at LOS B. The longest 95th percentile queue occurs on Industrial Drive in both peaks. The queue reaches 151m on the northern approach in the AM peak and 154m on the southern approach in the PM peak.

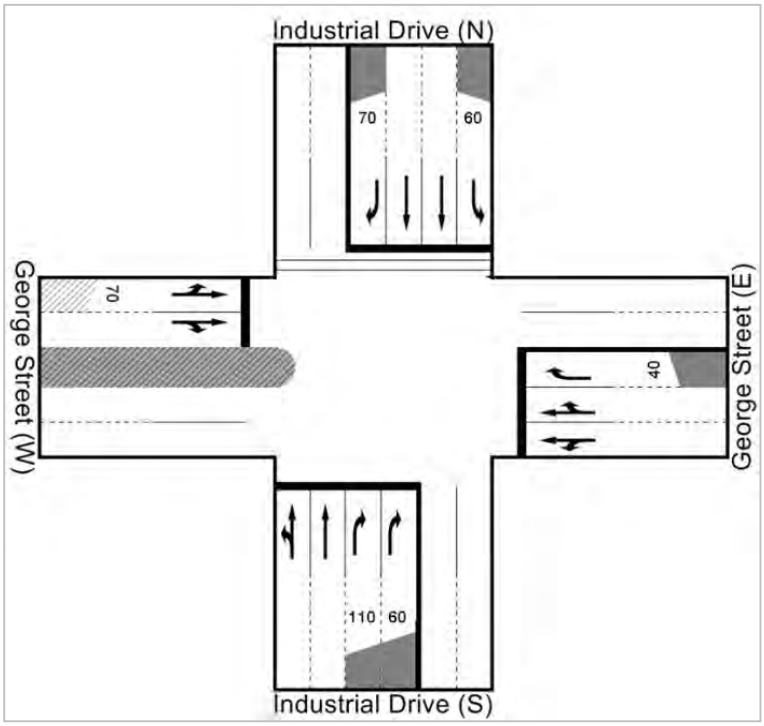


Figure 2-4: Industrial Drive / George Street Schematic Layout

Source: AECOM, 2010

Industrial Drive / Ingall Street

The Industrial Drive / Ingall Street intersection is a signalised intersection with a banned right turn from the south, and a left slip lane from the north. The schematic layout is illustrated in **Figure 2-5**, while **Table 2-5** and **Table 2-6** summarise the intersection performance based on the 2008 traffic flows for the AM and PM peak hours.

Table 2-5: 2008 AM Peak Hour Base Case Intersection Performance (Industrial Drive / Ingall Street)

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Ingall St (S Leg)	153	D	0.541	47.9	46
Industrial Drive (E Leg)	1,106	B	0.575	19.5	129
Ingall St (N Leg)	100	D	0.585	42.5	31
Industrial Drive (W Leg)	1,714	B	0.651	15.9	160
All Vehicles	**3,073**	**B**	**0.651**	**19.6**	**160**

Source: AECOM, 2010

Table 2-6: 2008 PM Peak Hour Base Case Intersection Performance (Industrial Drive / Ingall Street))

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Ingall St (S Leg)	164	D	0.528	45.6	61
Industrial Drive (E Leg)	1,508	B	0.817	24.7	223
Ingall St (N Leg)	186	D	0.818	47.8	54
Industrial Drive (W Leg)	1,283	B	0.811	24.1	134
All Vehicles	**3,141**	**B**	**0.818**	**26.9**	**223**

Source: AECOM, 2010

The results show that the intersection operates satisfactorily at LOS B during both the AM and PM peak. During the AM peak the largest 95th percentile queue occurs on Industrial Drive (western leg) and is indicated in the order of 160m, while during the PM peak, a 95th percentile queue in the order of 223m is indicated on Industrial Drive (eastern leg).

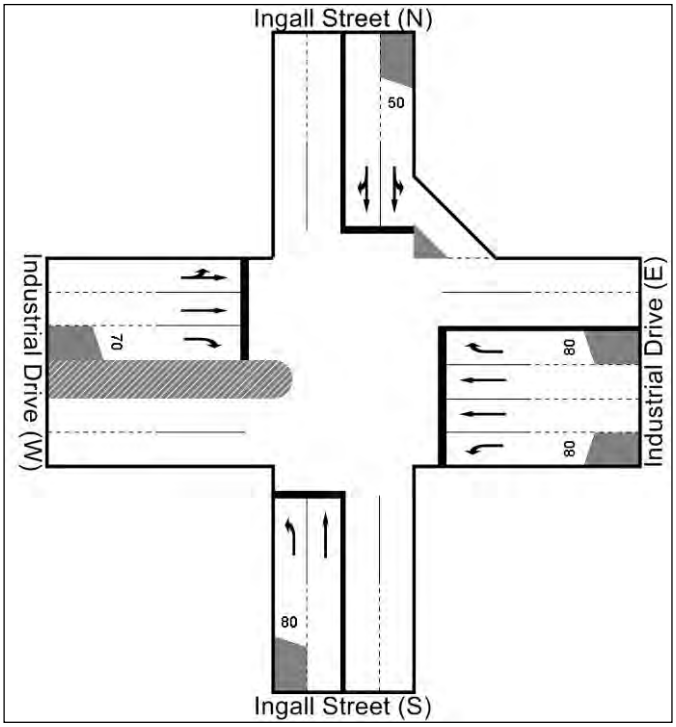


Figure 2-5: Industrial Drive / Ingall Street Schematic Layout

Source: AECOM, 2010

2.2 Rail Network

2.2.1 Description and Capacity of Infrastructure

Newcastle Port is currently served by two distinct rail loops – Kooragang Island and Port Waratah.

Kooragang Island is one of the busiest coal handling facilities in the world, connected via Kooragang Island Junction to the Main North Rail Line, and via Sandgate grade separation to the coal lines leading into coal mining districts in the Hunter Valley. For the purposes of this study, Kooragang Island and the Hunter Valley Coal chain will not be considered, except where it impacts on services to Port Waratah.

Port Waratah is a smaller coal handling facility, but also has a grain export facility that can be very heavily utilised in certain periods of the year. Port Waratah is connected to the Main North Rail Line via Islington Junction. There are a number of sidings and facilities connected to Port Waratah, namely:

- Port Waratah Coal handing facility;
- Brambles Sidings;
- Bullock Island Grain facility;
- Pasminco Siding;
- Grain Corp Grain loading facility;
- Morandoo Sidings; and
- OneSteel Sidings.

All of the above are connected to the Main North via Islington Junction, and two roads (Arrival Road and Storage Road 1). The Arrival Road services all but the Morandoo sidings and OneSteel, which are accessed via Storage Road 1 (see **Figure 2-6**).

A typical move for trains entering either facility from Sydney, is to head north on the Down Main, through Broadmeadow, moving across Islington Junction, then cross the Clyde Street Level crossing , before turning into the arrival roads for the port. Trains then cross from the Arrival Road onto Storage Road 1, and then onto Storage Road 2, before entering the Morandoo Sidings.

The Morandoo Arrival Road Links to the old BHP Billiton sidings (currently in use by OneSteel) and the link between the Morandoo and OneSteel Sidings are the subjects of this study.

The proposed port site is connected to Port Waratah via the One Steel Arrival Road. This siding, which will be used for any rail freight movements from the new berths, is currently used by OneSteel. The OneSteel site appears to be in use as an intermodal, with evidence of steel coils being transferred from rail wagons to trucks. This siding currently operates as a single siding, with no signalling control or separation for trains within the siding, so all operation is at 15km/h maximum by shunt manoeuvre. OneSteel currently operates up to three trains in and out of their site per day.

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ROAD AND RAIL NETWORK

Transport Assessment

Mayfield Site Port-Related Activities Concept Plan

Figure 2-6

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3.0 Future Transport Conditions and Capacity

3.1 Road Network

This section reviews the likely impacts of changes to the traffic flows on the road network for the future assessment years (2024 and 2034) without the proposed concept occurring at the site. These future assessment years have been chosen as they represent the estimated timeframes for:

- 2024 - the initial stage of the proposed concept with the container terminal operating at a capacity of 600,000 TEU per annum;
- 2034 - the final stage of the proposed concept with the container terminal operating at a capacity of 1 million TEU per annum.

While the development of the F3 – Branxton and the F3 – Raymond Terrace upgrade works are likely to occur during this time period, they are not expected to impact on site access and egress and hence have not been considered as part of this study.

3.1.1 Intersection Performance

A growth rate of 0.27% per annum has been determined based on historical RTA Traffic Volume Data (as discussed in **Section 2.1.3**). This yearly growth rate has been applied to the existing intersection flows to determine the future traffic conditions in 2024 and 2034, without the proposed concept.

The intersections of Industrial Drive / George Street and Industrial Drive / Ingall Street have been assessed using SIDRA Intersection 3.2 for the two future year scenarios. The intersection layouts were tested unchanged from the base layouts.

Industrial Drive / George Street

The 2024 AM and PM peak hour performance results for the intersection of Industrial Drive / George Street are presented in **Table 3-1** and **Table 3-2** respectively.

Table 3-1: 2024 AM Peak Intersection Performance, Industrial Drive / George Street – without development

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Industrial Drive (S Leg)	846	B	0.496	18.2	98
George St (E)	35	B	0.038	27.3	7
Industrial Drive (N Leg)	1,273	B	0.754	21.2	164
George St (W)	92	C	0.145	34.5	18
All Vehicles	**2,246**	**B**	**0.754**	**20.7**	**164**

Source: AECOM, 2010

Table 3-2: 2024 PM Peak Intersection Performance, Industrial Drive / George Street – without development

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Industrial Drive (S Leg)	1,196	B	0.781	25.2	167
George St (E)	33	C	0.030	28.8	5
Industrial Drive (N Leg)	1,061	B	0.687	21.3	135
George St (W)	53	C	0.068	31.5	9
All Vehicles	**2,343**	**B**	**0.785**	**23.6**	**167**

Source: AECOM, 2010

The results indicate that in 2024 the intersection is likely to continue performing at LOS B in both AM and PM peak hours. The additional back ground traffic growth has a minor impact on the performance of the intersection of Industrial Drive / George Street. In both peaks, the intersection has spare capacity.

The 2034 AM and PM peak hour performance results for the intersection of Industrial Drive / George Street are presented in **Table 3-3** and **Table 3-4** respectively.

Table 3-3: 2034 AM Peak Intersection Performance, Industrial Drive / George Street – without development

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Industrial Drive (S Leg)	867	B	0.508	18.3	100
George St (E)	37	B	0.039	27.5	8
Industrial Drive (N Leg)	1,305	B	0.773	22.2	172
George St (W)	95	C	0.151	34.5	18
All Vehicles	**2,304**	**B**	**0.773**	**21.3**	**172**

Source: AECOM, 2010

Table 3-4: 2034 PM Peak Intersection Performance, Industrial Drive / George Street – without development

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Industrial Drive (S Leg)	1,224	B	0.800	26.3	175
George St (E)	37	C	0.034	28.8	6
Industrial Drive (N Leg)	1,088	B	0.704	21.5	139
George St (W)	55	C	0.070	31.5	10
All Vehicles	**2,404**	**B**	**0.800**	**24.3**	**175**

Source: AECOM, 2010

The results indicate that in 2034 the intersection is likely to continue performing at LOS B in both AM and PM peak hours. The additional background traffic growth has a minor impact on the performance of the intersection of Industrial Drive / George Street. In both peaks, the intersection has spare capacity.

Industrial Drive / Ingall Street

The 2024 AM and PM peak hour performance results for the intersection of Industrial Drive / Ingall Street are presented in **Table 3-5** and **Table 3-6** respectively.

Table 3-5: 2024 AM Peak Intersection Performance, Industrial Drive / Ingall Street

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Ingall St (S Leg)	160	D	0.628	49.7	49
Industrial Drive (E Leg)	1,154	B	0.600	19.8	136
Ingall St (N Leg)	104	D	0.708	44.3	33
Industrial Drive (W Leg)	1,790	B	0.668	15.5	166
All Vehicles	**3,208**	**B**	**0.708**	**19.7**	**166**

Table 3-6: 2024 PM Peak Intersection Performance, Industrial Drive / Ingall Street

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Ingall St (S Leg)	171	D	0.517	44.6	62
Industrial Drive (E Leg)	1,575	C	0.873	32.1	268
Ingall St (N Leg)	194	D	0.806	47.5	55
Industrial Drive (W Leg)	1,340	B	0.844	25.4	144
All Vehicles	**3,280**	**C**	**0.873**	**30.9**	**268**

Source: AECOM, 2010

The results indicate that in 2024, the intersection is likely to perform at LOS B and C in the AM and PM peak respectively. Similar to the intersection of Industrial Drive / George Street, the additional background traffic growth between the existing traffic flows and 2024 traffic flows appears to have a minor impact on the intersection. The PM peak hour experiences a higher degree of saturation than the AM peak hour, particularly on Industrial Drive, but still performs satisfactorily.

The 2034 AM and PM peak hour performance results for the intersection of Industrial Drive / Ingall Street are presented in **Table 3-7** and **Table 3-8** respectively.

Table 3-7: 2034 AM Peak Intersection Performance, Industrial Drive / Ingall Street

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Ingall St (S Leg)	163	D	0.579	48.2	49
Industrial Drive (E Leg)	1,183	B	0.615	20.0	140
Ingall St (N Leg)	107	D	0.646	43.0	33
Industrial Drive (W Leg)	1,834	B	0.696	16.4	177
All Vehicles	**3,287**	**B**	**0.714**	**20.2**	**177**

Source: AECOM, 2010

Table 3-8: 2034 PM Peak Intersection Performance, Industrial Drive / Ingall Street

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Ingall St (S Leg)	176	D	0.531	44.7	64
Industrial Drive (E Leg)	1,614	C	0.894	36.2	293
Ingall St (N Leg)	199	D	0.841	49.0	58
Industrial Drive (W Leg)	1,372	B	0.865	25.9	148
All Vehicles	**3,361**	**C**	**0.894**	**33.2**	**293**

Source: AECOM, 2010

The results indicate that in 2034, the intersection is likely to perform at LOS B and C in the AM and PM peak respectively. Similar to the intersection of Industrial Drive / George Street, the additional background traffic growth between the existing traffic flows and 2034 traffic flows appears to have a minor impact on the intersection. The PM peak hour experiences a higher degree of saturation than the AM peak hour, particularly on Industrial Drive, but still performs satisfactorily.

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4.0 Transport Implications of Development Options

4.1 Introduction

This section contains analysis of the impact of the proposed concept, as proposed by NPC and shown in **Figure 4-1**, on the road and rail networks.

The Berth Precinct is expected to contain up to seven berths to support the five land-based precincts, with the Container Terminal Precinct requiring the use of three berths and the General Purpose, Bulk and General, Bulk Liquids and the NPC Operations Precincts each requiring the use of one berth. It is possible that one of the Container Terminal Precinct berth (Berth 4) may be shared with the General Purpose Precinct.

The following maximum ship movements are anticipated:

- 100 ships per annum for the General Purpose Precinct and the Bulk and General Precinct combined;
- 40 ships per annum for the Bulk Liquids Precinct; and
- 420 ships per annum for the Container Terminal Precinct.

The turnaround time for ships to load and unload while at berth is normally between one and two days.

The waterside impact of these additional ship movements on the operations and capacity of the Port of Newcastle has not been assessed in this report, although it has been discussed in Section 5.2.6 of the EA document. However, the potential landside road and rail impacts associated with the additional cargo volumes and shipping movements have been assessed in this report and on the basis of conservative (maximum) trade volumes.

Relevant RTA guidelines, including the RTA Guide to Trip Generating Developments were consulted in association with this assessment. However, detailed trade forecasts were provided by NPC and these have been used to predict trips generated by the proposed concept.

4.2 Precinct Development Potential

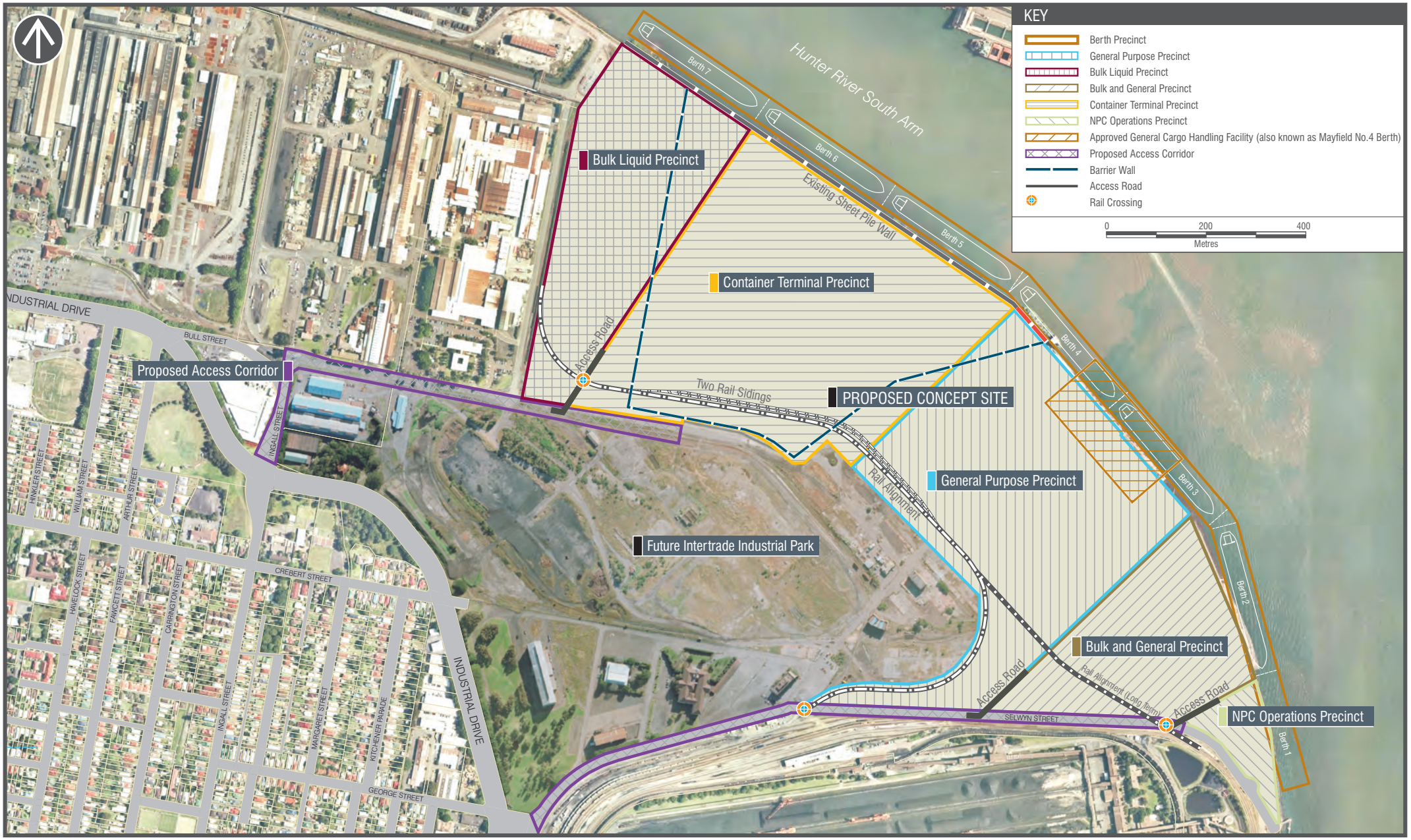
The existing and potential use for each precinct is discussed in **Table 4-1**.

Table 4-1: Precinct Development Potential

Precinct	Existing Use	Potential Use	Timing (from 2009)
NPC Operations (Berth 1)	None	NPC dredger vessel NCP Offices	5 - 10 years
Bulk & General Purpose (Berth 2)	Nothing	Use by bulk businesses including grain storage, briquettes, coke cargos and other infrastructure	2 - 10 years
General Purpose (Berth 3 and may share Berth 4 with the Container Terminal Precinct)	General cargo handling facility (Mayfield No.4 berth) – operational in 2010	Cargo; Break bulk; Containers; Heavy machinery; RO/RO	2- 25 years
Container Terminal (Berths 4, 5 & 6)	Koppers Carbon Materials & Chemicals – use of Berth facility only – tar piped to offsite facility	Containers	13 - 25 years
Bulk Liquid (Berth 7)	None	Facility for the receival, storage, blending and distribution of fuels and biofuels	2 - 5 years

Source: Newcastle Port Corporation, May 2009

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AECOM

CONCEPT PLAN

Transport Assessment

Mayfield Site Port-Related Activities Concept Plan

Figure 4-1

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4.3 Proposed Initial Operations (2024)

4.3.1 Precinct Trade Forecast and Likely Landside Modal Split

Table 4-2 shows the proposed initial operations for each precinct, as well as the proposed landside transportation modes.

Table 4-2: Proposed Initial Operations (2024)

Precinct	Trade and Type	Approximate Volume	Likely Landside Transport Requirements
NPC Operations (Berth 1)	NCP offices	N/A	N/A
Bulk & General Purpose (Berth 2)	Dry Bulk storage (feed grain, rice, canola etc)	0.4 MTPA	70% Road, 30% Rail
	Coke	0.25 MTPA	70% Road, 30% Rail
	Cement	0.7 MTPA	100% Road
	Boutique coal	0.5 MTPA	70% Road, 30% Rail
	Soda ash	0.1 MTPA	100% Road
	Fertiliser	0.25 MTPA	100% Road
	Meals	0.1 MTPA	100% Road
	Sand	0.1 MTPA	100% Road
	Total	**2.4 MTPA**	-
General Purpose (Berth 3 and may share Berth 4 with the Container Terminal Precinct)	Heavy machinery	0.1 MTPA	100% Road
	Roll on roll off cargo	0.1 MTPA	100% Road
	Project cargo	0.05 MTPA	100% Road
	Steel products	0.4 MTPA	70% Road, 30% Rail
	Timber products	0.1 MTPA	70% Road, 30% Rail
	Ammonia Nitrate	0.1 MTPA	100% Road
	Scrap Metal	0.2 MTPA	70% Road, 30% Rail
	Pine logs	0.3 MTPA	70% Road, 30% Rail
	Total	**1.35 MTPA**	-
Container Terminal (Berths 4, 5 and 6)	**Containers**	**600,000 TEU**	80% Road, 20% Rail
Bulk Liquid (Berth 7)	**Fuels and other bulk liquids**	**1,010 ML**	100% Road

Source: Newcastle Port Corporation, May 2009

* MTPA = Million Tonnes per Annum

** ML = Million Litres

*** TEU = Twenty-foot Equivalent Units of Containers

Of the initial proposed concept operation and associated truck movements, it is assumed that 75% are to take place during the day time, with the remaining 25% taking place at night[3].

The assumptions which underpin this road and rail assessment have been prepared based on:

- Detailed discussions with NPC in relation to expected cargo volumes and types and the likely timeframe for their introduction to the site over the 25 year timeframe of the proposed concept;
- Experience of how other major ports, such as Port Botany, operate in respect to the intensity of operations over a 24 hour period (eg. day vs night and AM/PM peaks) and the characteristics of how they manage the road and rail transport of cargos;
- The likely direction of traffic flow having regard to the geographic location of the potential markets for the various cargo types, the structure of the local and regional road networks, and the capacity of the two main local intersections;
- The limited capacity of the freight rail network between Newcastle and Sydney which means that only limited train paths will be available to the site in the short/medium term until such time as the upgrade of the North Sydney Freight Corridor is completed;
- There is limited landside area available at the site to support the number of rail sidings needed to allow for a significantly higher proportion of cargo movement by rail. This could change in the future depending on how the adjoining land to the south (Intertrade Industrial Park) is developed but at this stage the detail of this development is unknown.

4.3.2 Road Network

Road Access

For the purposes of this assessment, it has been assumed that the site will be accessed via two intersections:

- Industrial Drive / George Street; and
- Industrial Drive / Ingall Street.

As an initial assumption, the proposed access corridor connecting to the Industrial Drive / Ingall Street intersection (subject to the Hunter Development Corporation strategic planning process), has been assumed to serve the Container and Bulk Liquid Precincts. The remaining precincts (General Purpose, Bulk and General and NCP Operations) are assumed to gain access from Selwyn Street via the Industrial Drive / George Street intersection.

This assumption will be tested in the intersection analysis and, if the intersections are found to not operate satisfactorily, alternative access arrangements will be recommended.

Road Trip Generation

The trips generated by each mode are based on the landside transport requirements, as shown in **Table 4-2**. Loading assumptions for road vehicles are summarised in **Table 4-3**.

Table 4-3: Average Loading Assumptions

Per Truck	Unit	Quantity
Bulk	Tonnes	35
General Cargo	Tonnes	25
Containers	TEU	2
Bulk Liquid	ML	18

Source: AECOM, 2010 / Mark Waugh Pty Ltd, 2008

[3] Based on information provided by Newcastle Port Corporation, April 2010

All trade transported to the Bulk and General Precinct is assumed to be 'bulk'. All trade transported to/from the General Purpose Precinct, with the exception of ammonia nitrate, is assumed to be 'general cargo' and all trade transported to/from the Container Terminal Precinct is assumed to be transported by 'containers'.

The number of trucks transporting the fuels and other bulk liquids from the Bulk Liquid Precinct is based on one truck being able to transport 18ML of liquid per day.[4]

Table 4-4 indicates the number of trucks that will be required to transport containers, bulks, general cargo and liquids to/from the various precincts based on a 24 hours per day, 7 days a week operation with 75% of truck movements occurring during the day time and 25% of truck movements occurring at night.

The number of trucks predicted is based on the percentage of material to be transported by road, as shown in **Table 4-2**. The number of associated truck movements is based on two movements per truck (one movement into site and one movement out). The peak hour truck movements are assumed to be 50% higher than a normal hour and these have been used for the peak hour assessment of the road network and intersections.

Table 4-4: Proposed Initial Operations (2024) Truck Movement Scenarios

Precinct	Trucks per year	Trucks per day	Trucks per daytime hour	Truck movements per daytime hour	Truck movements per daytime peak hour
Bulk and General	58,714	161	8	16	24
General Purpose	40,857	112	5	11	16
Container Terminal	240,000	657	33	66	99
Bulk Liquid	20,481	56	3	6	9
Total	**360,052**	**986**	**49**	**99**	**148**

Source: AECOM, 2010

It is believed that in 2024 there will be a total of approximately 200 employees on site at any one time. The assumption that 75% of movements will occur during the day and 25% at night has also been applied to employee movements. Of the 75% of movements during the daytime, it has been assumed that 40% of employee movements associated with all precincts will occur during the peak hours. This is on the basis that employees are likely to work a shift pattern with start / finish times occurring outside the peak hours experienced on the wider road network[5].

While employee access to the site by means other than private car should be actively encouraged, a scenario of a vehicle occupancy rate of 1.0 has also been assumed, i.e. one car for every employee, in order to test the worst case for the impact on intersections. Workplace travel planning should be considered in the future Project applications for the individual terminals/precincts, when these are made by the prospective operators of the facilities. Access by walking, cycling and public transport should be considered.

Table 4-5 summarises the employee vehicles movements associated with the development in 2024.

Table 4-5: Proposed Initial Operations (2024) Employee Movements

Employees per day	Employee vehicles during daytime	AM Peak Hour		PM Peak Hour	
		In	Out	In	Out
200	150	60	0	0	60

Source: AECOM, 2010

[4] *Proposed Bulk Liquid Storage Depot, Mayfield North, NSW*, Mark Waugh Pty Ltd, Sept 2008

[5] Based on information provided by Newcastle Port Corporation, April 2010

Road Trip Distribution

For the peak hour vehicle movements, it has been assumed that 70% of traffic will be entering the site and 30% will be leaving the site in the AM peak and 40% will be entering the site and 60% will be leaving the site in the PM peak. Of the vehicles entering the site in both peak hours, it has been assumed that 80% will come from the north and 20% will come from the south. The same directional split has been assumed for vehicles exiting the site in both peak hours.[6]

The current geometry of the left turn from the Bull Street slip road into Ingall Street, which includes the level crossing arrangement of the railway line, appears to be too tight for large trucks to make this turn, and so it has been assumed that trucks travelling from the north accessing the Container and Bulk Liquid precincts will not use Bull Street to access the site, but will rather use the Industrial Drive / Ingall Street intersection. This is a worst case scenario and will be discussed later in this report.

Trucks accessing the General Purpose and Bulk and General precincts are assumed to use the Industrial Drive / George Street intersection. When exiting these precincts heading south, it has been assumed that vehicles will use the slip lane adjacent to Selwyn Drive to access Industrial Drive; therefore no trucks will turn left from George Street at the intersection of Industrial Drive / George Street.

It has also been assumed that the employee vehicles accessing the site will be evenly distributed between the two intersections with 50% of employee vehicles using the Industrial Drive / Ingall Street intersection and 50% using the Industrial Drive / George Street intersection.

Table 4-6 through **Table 4-9** show the peak hour truck and vehicle movements associated with the proposed concept at both intersections in 2024. These are shown graphically in **Figure 4-2**.

Table 4-6: 2024 AM Peak Hour Development Trips – Industrial Drive / Ingall Street Intersection

Precinct	In		Out	
	North	South	North	South
Container Terminal (HGV)	55	14	24	6
Bulk Liquid (HGV)	5	1	2	1
Employees (LV)	24	6	0	0
Total (HGV)	**60**	**15**	**26**	**6**
Total (LV)	**24**	**6**	**0**	**0**

Source: AECOM, 2010

Table 4-7: 2024 PM Peak Hour Development Trips – Industrial Drive / Ingall Street Intersection

Precinct	In		Out	
	North	South	North	South
Container Terminal (HGV)	32	8	47	12
Bulk Liquid (HGV)	3	1	4	1
Employees (LV)	0	0	24	6
Total (HGV)	**34**	**9**	**51**	**13**
Total (LV)	**0**	**0**	**24**	**6**

Source: AECOM, 2010

[6] Ibid

Table 4-8: 2024 AM Peak Hour Development Trips – Industrial Drive / George Street Intersection

Precinct	In		Out	
	North	South	North	South
Bulk and General (HGV)	14	3	6	-
General Purpose (HGV)	9	2	4	-
Employees (LV)	24	6	0	-
Total (HGV)	**23**	**6**	**10**	**-**
Total (LV)	**24**	**6**	**0**	**-**

Source: AECOM, 2010

Table 4-9:2024 PM Peak Hour Development Trips – Industrial Drive / George Street Intersection

Precinct	In		Out	
	North	South	North	South
Bulk and General (HGV)	8	2	12	-
General Purpose (HGV)	5	1	8	-
Employees (LV)	0	0	24	-
Total (HGV)	**13**	**3**	**20**	**-**
Total (LV)	**0**	**0**	**24**	**-**

Source: AECOM, 2010

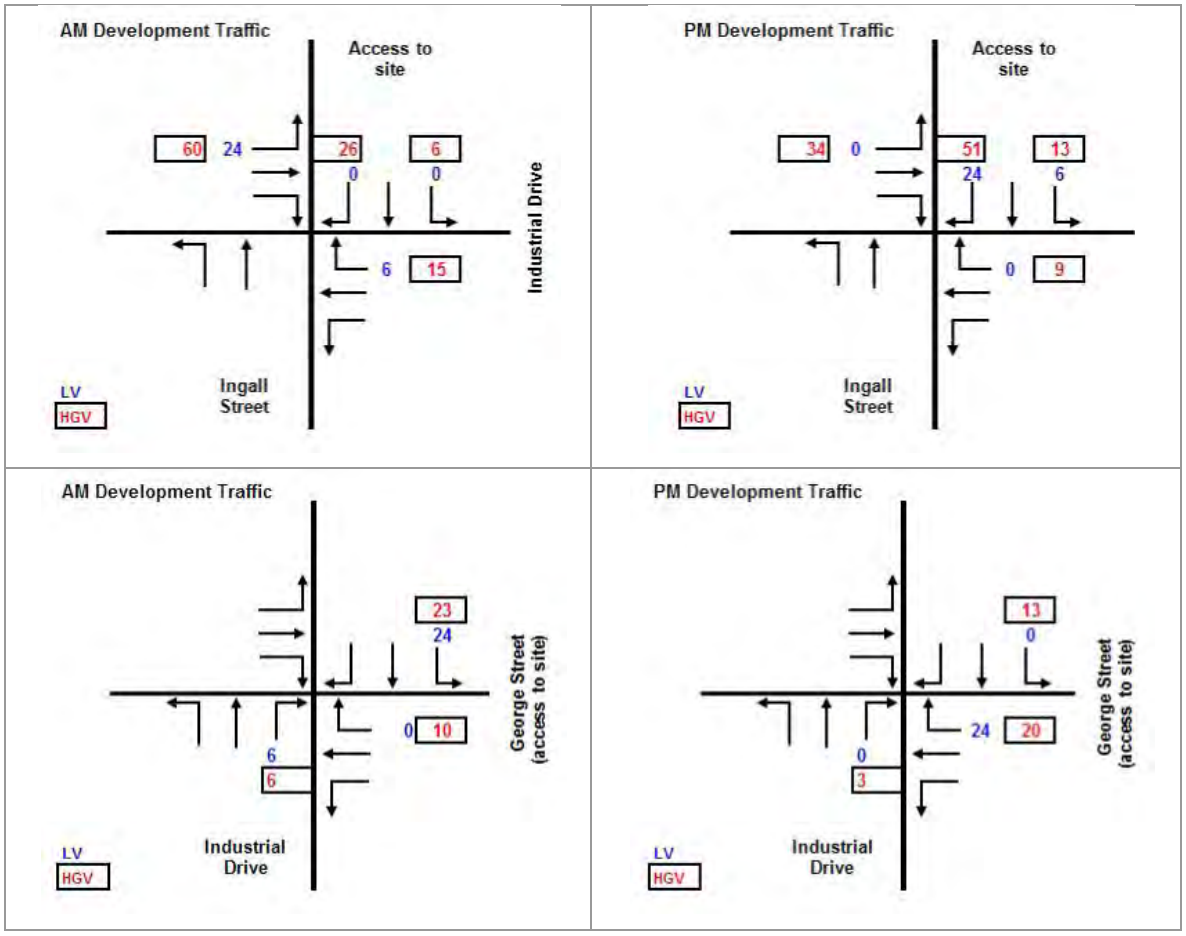


Figure 4-2: 2024 Peak Hour Development Traffic

Source: AECOM, 2010

Summary of Assumptions

The following assumptions have been made in order to assess the road network impact:

- 24 hour per day, 7 days a week operation (365 days per year);
- 75% of the proposed operations and associated truck movements will take place during the day, 25% taking place at night;
- Container trade forecasts: 600,000 TEUs – 80% transported by road / 20% by rail;
- 70% truck traffic enters and 30% exits the site in the AM peak hour;
- 40% truck traffic enters and 60% exits the site in the PM peak hour;
- 40% of all employee traffic enters and exits in the traffic peak hours;
- Of the above, all employee traffic enters in the AM peak hour and exits in the PM peak hour; and
- 80% of all traffic (trucks and vehicles) travels to/from the north and 20% travels to/from the south.

Road Impacts

It is expected that the proposed concept will generate 148 truck movements and 60 vehicle movements in the peak hours, based on the likely modal split indicated in **Table 4-2**, and shown in **Table 4-4** and **Table 4-5**.

The truck and vehicle movements generated by the proposed concept have been added to the forecast 2024 traffic flows at the intersections of Industrial Drive / George Street and Industrial Drive / Ingall Street. The intersections have again been assessed using SIDRA Intersection 3.2 using the base layouts. It should be noted that the distribution is based on the assumed internal road network and hence the Container Terminal Precinct traffic, which makes up approximately 65% of the generated traffic, is loaded onto the Industrial Drive / Ingall Street intersection. This intersection is therefore impacted to a greater degree than the Industrial Drive / George Street intersection.

Industrial Drive / George Street

The results of the assessment for the AM and PM peak hour in 2024 with the inclusion of the proposed concept traffic are shown in **Table 4-10** and **Table 4-11**.

Table 4-10: 2024 AM Peak Intersection Performance, Industrial Drive / George Street – with development traffic

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Industrial Drive (S Leg)	926	B	0.533	18.9	105
George St (E)	49	C	0.054	30.6	9
Industrial Drive (N Leg)	1,441	B	0.823	25.5	198
George St (W)	91	C	0.149	34.5	18
All Vehicles	**2,507**	**B**	**0.823**	**23.5**	**198**

Source: AECOM, 2010

Table 4-11: 2024 PM Peak Intersection Performance, Industrial Drive / George Street – with development traffic

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Industrial Drive (S Leg)	1,310	C	0.848	30.6	202
George St (E)	79	C	0.140	33.7	17
Industrial Drive (N Leg)	1,174	B	0.750	23.3	154
George St (W)	56	C	0.071	31.4	10
All Vehicles	**2,619**	**B**	**0.851**	**27.4**	**201**

Source: AECOM, 2010

The results show that in 2024, the proposed concept traffic is likely to have a negligible impact on the Industrial Drive / George Street intersection, as the intersection is likely to perform at LOS B in both peaks. There is a minimal change in the spare capacity between the future scenario without the proposed concept and the future scenario with the proposed concept and therefore no specific mitigation measures would be required.

Based on the degree of saturation, the intersection operates with approximately 17% and 15% spare capacity in the AM and PM peak hours respectively. If an internal road was present linking the various precincts it would enable a higher distribution of trips from the site to the Industrial Drive / George Street intersection. Assuming that trips generated by the Container Terminal Precinct use the Industrial Drive / George Street intersection as opposed to the Industrial Drive / Ingall Street intersection, the Industrial Drive / George Street intersection is likely to continue to perform at LOS B in the AM and PM peaks, as shown in **Table 4-12** and **Table 4-13**.

Table 4-12: 2024 AM Peak Intersection Performance, Industrial Drive / George Street – with development traffic and link road

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Industrial Drive (S Leg)	949	B	0.538	19.5	106
George St (E)	72	C	0.139	34.6	14
Industrial Drive (N Leg)	1,469	B	0.823	25.6	198
George St (W)	91	C	0.149	34.5	18
All Vehicles	**2,608**	**B**	**0.823**	**23.9**	**198**

Source: AECOM, 2010

Table 4-13: 2024 PM Peak Intersection Performance, Industrial Drive / George Street – with development traffic and link road

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Industrial Drive (S Leg)	1,318	C	0.848	30.8	202
George St (E)	126	C	0.304	36.8	36
Industrial Drive (N Leg)	1,206	B	0.750	23.4	154
George St (W)	56	C	0.071	31.4	10
All Vehicles	**2,706**	**B**	**0.851**	**27.8**	**201**

Source: AECOM, 2010

Industrial Drive / Ingall Street

The results of the assessment for the AM and PM peak hour in 2024 with the inclusion of the proposed concept traffic are shown in **Table 4-14** and **Table 4-15**.

Table 4-14: 2024 AM Peak Intersection Performance, Industrial Drive / Ingall Street – with development traffic

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Ingall St (S Leg)	171	D	0.428	43.3	47
Industrial Drive (E Leg)	1,258	B	0.764	23.6	156
Ingall St (N Leg)	145	D	0.830	49.1	58
Industrial Drive (W Leg)	2,004	B	0.841	25.3	268
All Vehicles	**3,578**	**B**	**0.841**	**26.6**	**268**

Source: AECOM, 2010

Table 4-15: 2024 PM Peak Intersection Performance, Industrial Drive / Ingall Street – with development traffic

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Ingall St (S Leg)	183	C	0.419	36.7	59
Industrial Drive (E Leg)	1,699	F	1.085	213.9	785
Ingall St (N Leg)	303	F	1.076	159.1	221
Industrial Drive (W Leg)	1,472	C	1.000	42.4	213
All Vehicles	**3,657**	**F**	**1.085**	**131.5**	**785**

Source: AECOM, 2010

The results show that in 2024 in the AM peak, the Industrial Drive / Ingall Street Intersection is likely to operate satisfactorily at LOS B, however it is not likely to operate satisfactorily in the PM peak with LOS F. The intersection is over capacity and results in long delays and queuing.

In order to alleviate the impact on the Ingall Street intersection, diverting a proportion of trucks to the George Street intersection was considered. Analysis indicated that the George Street intersection had spare capacity before the diversion.

An internal road network with a link road connecting all the precincts would ensure a strategic distribution of trucks between the two intersections. Trips generated by the Container Terminal Precinct could then use the Industrial Drive / George Street intersection as opposed to the Industrial Drive / Ingall Street intersection and this scenario has been tested below.

This mitigation measure would have the greatest impact on the Ingall Street / Industrial Drive intersection in terms of improved performance and spare capacity, with this intersection likely to operate at LOS B in the AM and PM peaks, as shown in **Table 4-16** and **Table 4-17**.

Table 4-16: 2024 AM Peak Intersection Performance, Industrial Drive / Ingall Street – with development traffic and link road

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Ingall St (S Leg)	171	D	0.600	48.3	51
Industrial Drive (E Leg)	1,244	B	0.657	21.4	150
Ingall St (N Leg)	115	D	0.738	44.9	37
Industrial Drive (W Leg)	1,949	B	0.740	17.0	196
All Vehicles	**3,479**	**B**	**0.745**	**21.0**	**196**

Source: AECOM, 2010

Table 4-17: 2024 PM Peak Intersection Performance, Industrial Drive / Ingall Street – with development traffic and link road

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Ingall St (S Leg)	183	D	0.800	54.5	74
Industrial Drive (E Leg)	1,691	B	0.854	26.5	264
Ingall St (N Leg)	244	B	0.542	28.3	46
Industrial Drive (W Leg)	1,440	B	0.839	23.1	145
All Vehicles	**3,558**	**B**	**0.854**	**26.7**	**264**

Source: AECOM, 2010

4.3.3 Rail Network

Rail Access

Use of the Main North Corridor depends very much on the price of petrol (and hence rail's share of the freight demand), coal, and demand for import and export for goods. The corridor is heavily utilised; however, initial discussions with RailCorp and ARTC indicate that there may currently be 4 available train paths per day. This is likely to be one prior to the morning curfew, one post morning curfew, one prior to the afternoon curfew, and one post the afternoon curfew. This would mean that two trains may arrive at the port in short succession (post morning and prior to afternoon curfew) and a holding road may be required at the port to hold the next incoming train while the loading and unloading takes place.

A joint discussion needs to take place with ARTC and RailCorp, in order to verify the exact paths that would be available on the Main North Corridor.

It is important to note that in the long term, the Northern Sydney Freight Corridor project will create 80 train paths per day, independent of the Metropolitan Passenger Network, and the notion of curfews would disappear. Access to Sydney would then be virtually unrestricted.

Rail Demand Generation and Distribution

For the purposes of this study, the following is assumed:

- Calculations are based on the trade forecasts given in **Table 4-2.** It is assumed 60% of containers are exported and 40% are imported.[7]
- The source and destination for all trade is Sydney, except for coal which is assumed to be the Hunter Region. At this point no trade from the North Coast or the Hunter Region has been identified, other than boutique coal.
- Train loads are based on the operating manual for the Main North Line. Class 81/82 locomotives will be used, pulling a maximum load of 1,130 tonnes per locomotive. Given the restriction in operating space within the port, a typical train length of around 800m is likely to be operated (this has been discussed and agreed with ARTC).
- The current standard train consist for both Queensland Rail Freight and Pacific National is a 1,244m freight train consisting of 2 x 600m wagon rakes and 2 locomotives. Due to the gradients around Cowan, this length of train is not actually achievable on the Main North Line; therefore the facilities will also be designed to cope with shorter more frequent services. See below for train lengths by trade type.

The demand can be split into Bulk, General and Container freight. Bulk freight typically operates at the maximum axle load limit for the rail line, which in this case is 25 tonnes per axle. General freight typically operates at around half that figure. Container freight tends to include a lot of empty container transfers, so the loads are mixed. Typical average container weights are 15 tonnes export, and 10 tonnes import. The number of trips has been assumed based on a typical train consist.

Using the above, the predicted number of train paths required is:

- Boutique Coal from Hunter Region – 150,000 tonnes per annum, by rail via the Hunter. A typical Hunter Region train is 3 locomotives and 91 wagons, and can move 6,825 tonnes per train, therefore the number of trains is negligible at 0.08 trains per day (2 trains per month).
- Bulk from Sydney (coke and dry bulk storage) – 187,500 tonnes per annum by rail via Sydney and the Main North Line. A bulk freight train will be shorter than a container train because of the higher axle load per wagon. It is assumed that a bulk train will be made up of 3 locomotives and 33 wagons (the train consist is limited by the 1,130 tonnes load per locomotive limit on the Cowan Bank), the train length is approximately 700m and a freight load is 2,516 tonnes per train, therefore this requires 0.25 trains per day (75 trains per year).
- General freight from Sydney – 300,000 tonnes per annum via the Main North Line. Trains are likely to be 2 locomotives and 39 wagons, for a total length of 787m, with a total load per train of 1,462 tonnes. This requires 0.65 trains per day (157 trains per annum).

[7] Based on existing trade movement at Port Botany.

- Container Export – The freight demand for initial operations in 2024 is 600,000 TEU, 20% are moved by rail. Therefore 120,000 TEU to be imported and exported. Assume 60% export, therefore 72,000 TEU per annum move via the Main North Line. Train size is likely to be 766m (38 wagons and 2 locomotives), which can take 114 TEUs per train. Therefore 2.01 trains per day are required to move the containers to and from Sydney (631 trains per annum).
- Container Import – 48,000 TEU per annum via the Main North Line. Assuming the same train as before therefore requires 1.33 trains per day. It is assumed that this is incorporated into the units going to Newcastle Port for exports to save on paths as well as loading and unloading times.

For the proposed concept there would need to be approximately 3 trains per day running into the port for the initial operations scenario in 2024. All of the above is calculated assuming 315 operating days per year for rail (due to track closures, possessions etc).

Rail Impacts

Train loading and unloading time for the proposed concept will be based on the worst case train configuration, which is a 766m train. This is as follows:

- Train break in half into 2 x 520m long sidings = 0.5 hours
- Unload 114 containers = 1.2 hour
- Load 76 containers = 0.8 hours
- Inspect Wagons = 1 hour
- Test locomotive = 0.5 hours
- Test brakes = 0.25 hours
- Reform train to 766m = 0.5 hours
- Shunting manoeuvres = 0.5 hours

Therefore, the total time each train would be in the siding = 5.25 hours.

Based on the fact that there are 3 trains per day required for the initial operations scenario in 2024, and that time must be allowed for OneSteel trains (three per day) to move in and out of their facility, there needs to be a minimum of two new rail sidings provided within the site. In order to cut down the impact on OneSteel, the locomotives need to be stored in the sidings during loading and unloading, so the minimum siding length should be:

Rake length + 2 x locomotive length + 15m = 464m minimum.

Figure 4-3 provides a visual representation of the potential train operation. This shows that two sidings of around 520m length can be accommodated within the site.

Operation

The envisaged operation is that a maximum length of 766m train will be arrive via the number 6 road in the Morandoo Sidings and will cross over to the number 7 road via a new crossover and then onto the old BHP Billiton rail road, now called the OneSteel Arrival Road. Note that the number 7 road is currently disconnected in Morandoo Siding and therefore a new linking crossover will need to be constructed.

The train will enter the first of the loading sidings, such that the back of the train is clear of the Selwyn Street level crossing, but with the break point of the wagons still short of the siding points (i.e. still on the OneSteel access road). The back half of the train will then be broken off and temporarily parked, and the front half will be moved forward clear of the points and into the siding and parked. The locomotives will detach and leave the siding and run back around to pick up the back half of the rake, and that will be dragged into the second siding and parked.

This leaves the OneSteel Arrival Road clear for OneSteel trains to enter and leave while the port train is being loaded and unloaded. Given that there will be 2 trains in this section at any one time (i.e. one train in the One Steel facility and one train in the port sidings), it is possible that the OneSteel Arrival Road will need to be signalled.

The train is then reformed after loading by the reverse move carried out on entry. The entire consist is then reversed back over the Selwyn Street level crossing into the number 6 road in Morandoo Sidings, before leaving via the Port Waratah loop.

The above operation can be undertaken for the initial years of the proposed concept, while the freight task builds up. Once the freight task requires more than 2 trains per day (approximately 66% of initial capacity and 50% of final capacity), an exit road will need to be installed connecting to the Bullock Island Loop in order to deal with the increase in train operations.

The Main North Line has limited available paths, and there will increasingly be a risk that trains entering the port are forced to arrive before the loaded trains have left and therefore they will need to be stored in the Morandoo Sidings. This will increase the risk of blockages to OneSteel, grain and coal trains as the entry road to Port Waratah becomes congested and as a result scheduling of these train movements will be needed.

By the time the freight task increases to a point where 3 trains per day are required, an exit road connecting to the Bullock Island Loop will need to be installed to allow trains leaving the port to leave without having to make the reversing move back to the number 6 road in the Morandoo Sidings.

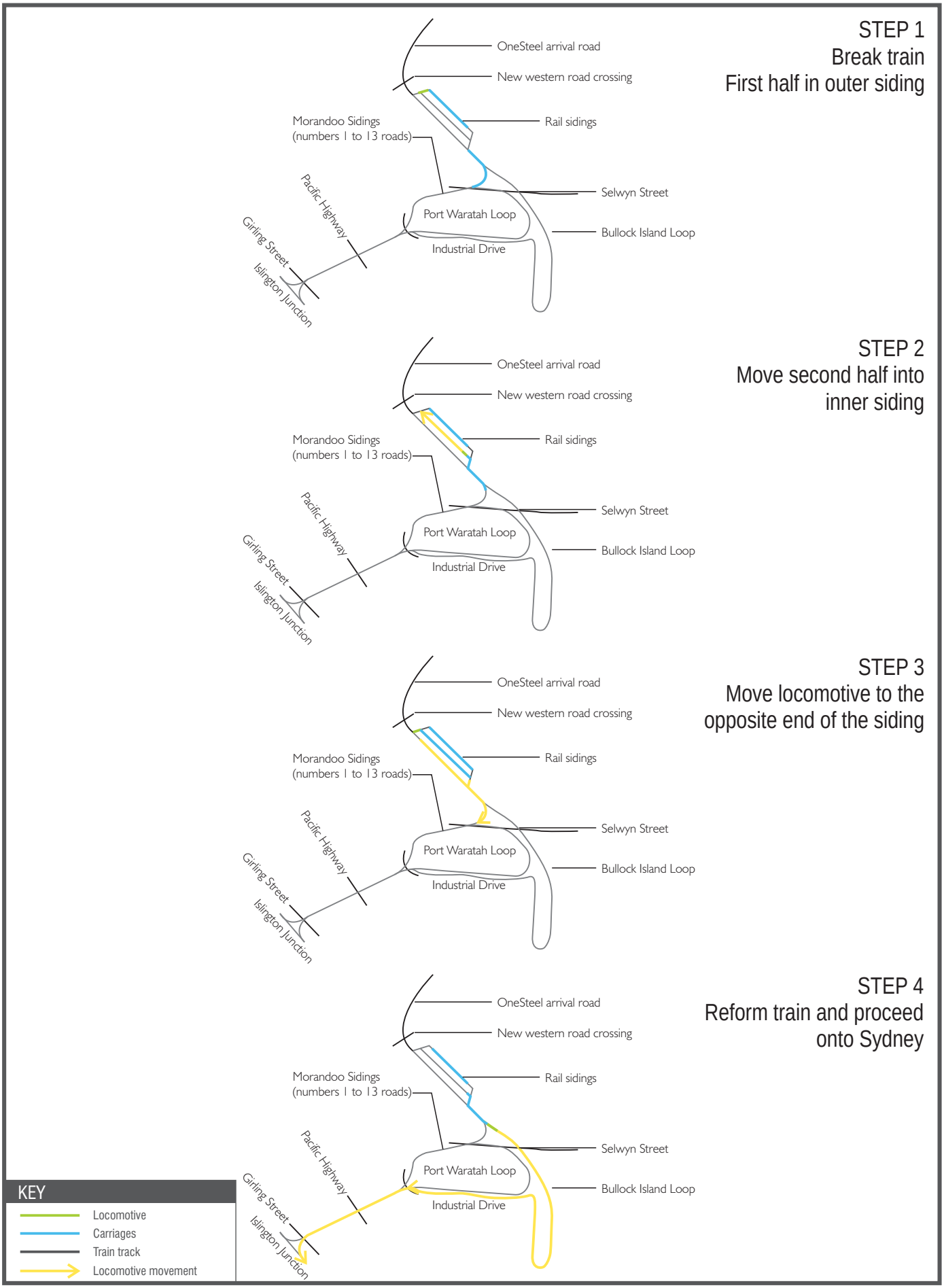
This has two advantages. Firstly, it will reduce train cycling times by 30 minutes as the reversing move is removed, and trains can exit by going straight out of the loop, and secondly it allows two trains to arrive and be held in the Morandoo Sidings. One train will arrive and be broken into its two halves and stored in the number 4 and 5 roads, and the other can then wait on the number 6 (entry) road. This has huge operational advantages for ARTC and for the port, as use of the port loading facility can be maximised by ensuring that there is always a train waiting to enter.

The only issue with holding trains in the number 6 road is that it blocks OneSteel's access to its arrival road. Given that there are some hours between trains entering and leaving, this can be co-ordinated with OneSteel.

Operational Constraints

There are several constraints to be looked at:

- OneSteel requires access to their facility, therefore the Morandoo Arrival Road (road number 13) and the OneSteel Arrival Road need to be kept clear. This means that trains cannot be parked in the number 6 road on arrival for any length of time, as they are too long for the siding and will block access and egress for OneSteel trains. If a Port train needs to be held in Morandoo Sidings for some hours while it waits for entry into the port site, then it will be broken in two and parked in the number 4 and 5 roads in the Morandoo Sidings. If it is only a short term park, then the number 6 road can be used and potential conflict with One Steel trains can be easily managed by scheduling these train movements.
- Selwyn Street level crossing sits between the Morandoo siding and the port. The level crossing will be closed for only relatively short periods of time (5-6 minutes per train movement) while trains enter and exit the port. The impact on Selwyn Street is that the level crossing will close for 5-6min at a time, up to 10 times per day. This is 3 OneSteel trains entering and leaving, and 2 Port trains, entering and leaving. This crossing will likely need to become a full barrier as a minimum and an ALCAM assessment should be undertaken once vehicle numbers have been properly identified;
- The new western road crossing of the railway line that will be required to service the Container Terminal and Bulk Liquid Precincts may also require treatment to separate road and rail movements. If this crossing is kept more than 65m from the toes of points for the siding (on the western side), then the port train locomotives shunting back on the OneSteel Arrival Road will turn back prior to reaching the level crossing, meaning that the only rail traffic crossing the new level crossing will be OneSteel trains (3 trains per day).
- The Main North Line operates under a freight train curfew during the peak hours. This means that running trains between Newcastle and Sydney needs to be carefully planned. It is quite possible that this curfew will cause path restrictions to Newcastle. This issue should be discussed with ARTC and RailCorp;
- This freight train curfew will be removed when the North Sydney Freight Corridor Upgrade project is completed but this is likely to occur in a medium/longer term timeframe; and
- Use of the Morandoo Arrival Road will require a discussion to take place with Pacific National to ensure that the siding is available for use.



AECOM

TRAIN MOVEMENTS

Transport Assessment

Mayfield Site Port-Related Activities Concept Plan

Figure 4-3

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Rail Mode Share Sensitivity Testing

This sensitivity analysis will be based on testing the percentage road and rail mode shares as proposed in **Table 4-2.**

Assumptions:

- For the modal split for various cargo types, it is assumed wherever the roads total is not 100% that the remainder is moved by rail.
- The following loads apply to trains.
  Bulk Freight – 1,900 tonnes per train
  Containers – 114 TEU per train
- It is assumed that there are 315 operating days per year.

The sensitivity of rail impact can be viewed in **Table 4-18** where the top left cell is the base case for the freight task (i.e. 20% of containers by rail and 30% of bulk by rail), and an increase in the rail mode share for containers to 40% and for bulk to 50% is tested in the other cells. The numbers presented are trains per day based on the above assumptions.

Table 4-18: 2024 Rail Mode Share Sensitivity Testing

600,000 TEU	Bulk 30% By Rail	Bulk 50% by Rail	Notes
Container 20% by Rail	3.1#	3.8	No new infrastructure required within the port. North Sydney Freight Corridor would be required for 50% bulk.
Container 40% by Rail	5.1	5.8	Additional sidings, gantries and North Sydney Freight Corridor required)

This is the base case modelled scenario

Source: AECOM, 2010

Assessing the infrastructure within the Mayfield site, there is room for 2 sidings, long enough to each take half a train. The marshalling, load and unload times for a single train is around 5.25 hours. Therefore, the Mayfield site can theoretically handle a maximum of 4.6 trains per day.

There are operational difficulties associated with increasing the number of sidings at the site. Firstly, running a third siding in parallel means that reach stackers cannot be used, and the port will be forced to invest in gantries. If rail is to move more than the base case modal split, then a second set of sidings would need to be installed, and gantries would be used for all 4 sidings rather than reach stackers.

If the site is set up to include additional space for reach stackers, then valuable land is lost to the port side, and the port operation becomes restricted. Also the reach stackers will need to run around the trains in the siding, thereby increasing dramatically the amount of traffic within the port (equal to probably double the number of TEU's to be moved per annum). Gantries can reach over 5 sidings and therefore solve the operational problems, however, they are more expensive to install and operate.

A second issue for discussion is the Main North Line capacity. The Main North Line only has 4 paths available per day, until the North Sydney Freight Corridor Project is built. This means that many of the cases can only work if the freight is not sent to Sydney, but rather inland or up north. This could drive development of a small yard outside of Newcastle, to bring the trains in and reform them as 1,500m Superfreighters, for the trip to Sydney. Four of these trains could service the equivalent of 7.6 of the port trains which are 766m in length. This would provide a good level of capacity for the port. There may be potential to do this in the Broadmeadow Yard, however, this would also require further investigation.

In conclusion, servicing more than 4.6 trains per day would require construction of the North Sydney Freight Corridor, and would trigger the need for additional rail sidings in the port area to be built, to assist with the freight.

There is also a growing risk of operational clashes with entry and exit to the Port Waratah Loop, and a more detailed investigation would need to be undertaken into the rail operation, and discussions should be held with stakeholders.

4.4 Proposed Final Operations (2034)

4.4.1 Precinct Trade Forecast and Likely Landside Modal Split

Table 4-19 shows the final operations for the proposed concept for each precinct within the site, as well as the likely landside transportation modes. The difference between the final and initial operations is the increase in the amount of containers from 600,000 TEUs to 1,000,000 TEUs per annum, the increase in number of precinct employees from 200 to 300 employees and the future year for completion of 2034.

Table 4-19: Proposed Final Operations (2034)

Precinct	Trade and Type	Approximate Volume	Likely Landside Transport Requirements
NPC Operations (Berth 1)	NCP offices	N/A	N/A
Bulk & General Purpose (Berth 2)	Dry Bulk storage (feed grain, rice, canola etc)	0.4 MTPA	70% Road, 30% Rail
	Coke	0.25 MTPA	70% Road, 30% Rail
	Cement	0.7 MTPA	100% Road
	Boutique coal	0.5 MTPA	70% Road, 30% Rail
	Soda ash	0.1 MTPA	100% Road
	Fertiliser	0.25 MTPA	100% Road
	Meals	0.1 MTPA	100% Road
	Sand	0.1 MTPA	100% Road
	Total	**2.4 MTPA**	**-**
General Purpose (Berth 3 and may share Berth 4 with the Container Terminal Precinct)	Heavy machinery	0.1 MTPA	100% Road
	Roll on roll off cargo	0.1 MTPA	100% Road
	Project cargo	0.05 MTPA	100% Road
	Steel products	0.4 MTPA	70% Road, 30% Rail
	Timber products	0.1 MTPA	70% Road, 30% Rail
	Ammonia Nitrate	0.1 MTPA	100% Road
	Scrap Metal	0.2 MTPA	70% Road, 30% Rail
	Pine logs	0.3 MTPA	70% Road, 30% Rail
	Total	**1.35 MTPA**	**-**
Container Terminal (Berths 4, 5 and 6)	**Containers**	**1,000,000 TEU**	80% Road, 20% Rail
Bulk Liquid (Berth 7)	**Fuels and other bulk liquids**	**1,010 ML**	100% Road

Source: Newcastle Port Corporation, May 2009

* MTPA = Million Tonnes per Annum

** ML = Million Litres

*** TEU = Twenty-foot Equivalent Units of Containers

The assumptions which unpderpin this road and rail assessment have been prepared based on:

- Detailed discussions with NPC in relation to expected cargo volumes and types and the likely timeframe for their introduction to the site over the 25 year timeframe of this Concept Plan;
- Experience of how other major ports, such as Port Botany, operate in respect to the intensity of operations over a 24 hour period (eg. day vs night and AM/PM peaks) and the characteristics of how they manage the road and rail transport of cargos;
- The likely direction of traffic flow having regard to the geographic location of the potential markets for the various cargo types, the structure of the local and regional road networks, and the capacity of the two main local intersections;
- The limited capacity of the freight rail network between Newcastle and Sydney which means that only limited train paths will be available to the site in the short/medium term until such time as the upgrade of the North Sydney Freight Corridor is completed;
- There is limited landside area available at the site to support the number of rail sidings needed to allow for a significantly higher proportion of cargo movement by rail. This could change in the future depending on how the adjoining land to the south (Intertrade Industrial Park) is developed but at this stage the detail of this development is unknown.

Road Network

Road Traffic Access, Generation and Distribution

The loading assumptions and landside modal split for the proposed final operations are unchanged from the proposed initial operations (discussed in **Section 4.3.2**).

Table 4-20 shows the number of truck movements associated with the proposed concept final operation. The main change has been the increase in the container terminal trucks movements from 148 to 214 per peak hour. Employee movements have increased from 60 to 90 per peak hour as shown in **Table 4-20**.

As the intersection of Industrial Drive / Ingall Street only performed satisfactorily with the addition of an internal road link under the 2024 scenario with development, the 2034 with development scenario for both intersections has only been modelled with the link road in place. The assumptions with regards to distribution associated with the link road remain unchanged from the 2024 scenario, namely that all of the Container Terminal truck movement access and egress through the Industrial Drive / George Street intersection.

It has been assumed that the road traffic distribution pattern will remain unchanged to that of the initial operations of the proposed concept, i.e. 80% of all traffic travels to/from the north and 20% travels to/from the south.

Table 4-20: Proposed Final Operations (2034) Truck Movement Scenarios

Precinct	Trucks per year	Trucks per day	Trucks per daytime hour	Truck movements per daytime hour	Truck movements per daytime peak hour
Bulk and General	58,714	161	8	16	24
General Purpose	40,857	112	5	11	16
Container Terminal	400,000	1,096	55	110	165
Bulk Liquid	20,481	56	3	6	9
Total	**520,052**	**1,425**	**71**	**142**	**214**

Source: AECOM, 2010

Table 4-21: Proposed Final Operations (2034) Employee Vehicle Movements

Employee vehicles per day	Employee vehicles during daytime	AM Peak Hour		PM Peak Hour	
		In	Out	In	Out
300	225	90	0	0	90

Source: AECOM, 2010

Table 4-24 through **Table 4-27** show the AM and PM peak hour truck and car movements associated with the proposed concept at both intersections, and this is shown graphically in **Figure 4-4**.

Table 4-22: 2034 AM Peak Hour Development Trips – Industrial Drive / Ingall Street Intersection – with link road

Precinct	In		Out	
	North	South	North	South
Container Terminal (HGV)	0	0	0	0
Bulk Liquid (HGV)	5	1	2	1
Employees (LV)	36	9	0	0
Total (HGV)	**5**	**1**	**2**	**1**
Total (LV)	**36**	**9**	**0**	**0**

Source: AECOM, 2010

Table 4-23: 2034 PM Peak Hour Development Trips – Industrial Drive / Ingall Street Intersection – with link road

Precinct	In		Out	
	North	South	North	South
Container Terminal (HGV)	0	0	0	0
Bulk Liquid (HGV)	3	1	4	1
Employees (LV)	0	0	36	9
Total (HGV)	**3**	**1**	**4**	**1**
Total (LV)	**0**	**0**	**36**	**9**

Source: AECOM, 2010

Table 4-24: 2034 AM Peak Hour Development Trips – Industrial Drive / George Street Intersection – with link road

Precinct	In		Out	
	North	South	North	South
Container Terminal (HGV)	92	23	39	-
Bulk and General (HGV)	14	3	6	-
General Purpose (HGV)	9	3	4	-
Employees (LV)	36	9	0	
Total (HGV)	**115**	**29**	**49**	**-**
Total (LV)	**36**	**9**	**0**	**-**

Source: AECOM, 2010

Table 4-25: 2034 PM Peak Hour Development Trips – Industrial Drive / George Street Intersection – with link road

Precinct	In		Out	
	North	South	North	South
Container Terminal (HGV)	53	13	79	-
Bulk and General (HGV)	8	2	12	-
General Purpose (HGV)	5	1	8	-
Employees (LV)	0	0	36	
Total (HGV)	**66**	**16**	**99**	**-**
Total (LV)	**0**	**0**	**36**	**-**

Source: AECOM, 2010

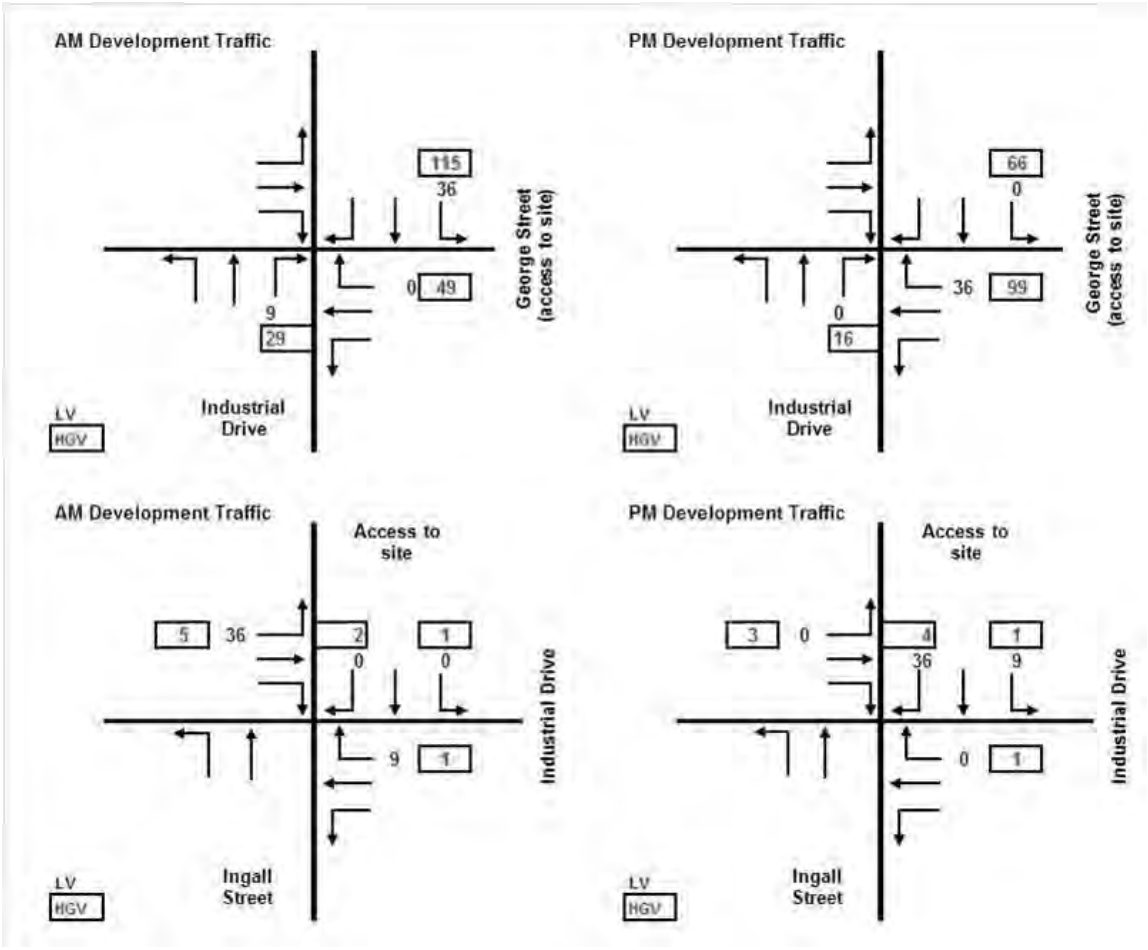


Figure 4-4: 2034 Peak Hour Development Trips – with link road

Source: AECOM, 2010

Road Impacts

It is expected that the proposed concept will generate 214 truck movements and 90 vehicle movements in the peak hours.

The truck and vehicle movements generated by the proposed concept have been added to the forecast 2034 traffic flows at the intersections of Industrial Drive / George Street and Industrial Drive / Ingall Street. The intersections have again been assessed using SIDRA Intersection 3.2 using the base layouts.

Industrial Drive / George Street – with link road

The results of the assessment for the AM and PM peak hour in 2034 with the inclusion of the proposed concept traffic and internaload link are shown in **Table 4-26** and **Table 4-27**.

Table 4-26: 2034 AM Peak Intersection Performance, Industrial Drive / George Street – with development traffic and link road

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Industrial Drive (S Leg)	988	B	0.553	20.1	109
George St (E)	90	C	0.200	36.2	21
Industrial Drive (N Leg)	1,584	B	0.845	27.7	213
George St (W)	94	C	0.154	34.5	19
All Vehicles	**2,756**	**B**	**0.845**	**25.5**	**213**

Source: AECOM, 2010

Table 4-27: 2034 PM Peak Intersection Performance, Industrial Drive / George Street – with development traffic and link road

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Industrial Drive (S Leg)	1,358	C	0.871	33.8	218
George St (E)	172	C	0.436	38.1	51
Industrial Drive (N Leg)	1,260	B	0.770	24.4	162
George St (W)	58	C	0.074	31.4	10
All Vehicles	**2,848**	**C**	**0.871**	**29.9**	**217**

Source: AECOM, 2010

The results show that the proposed concept traffic is likely to have a negligible impact on the Industrial Drive / George Street intersection as the intersection is likely to perform at LOS B and LOS C in the AM and PM peak respectively. The intersection continues to operate with spare capacity in the future scenarios with the proposed concept and the internal link road and therefore no specific mitigation measures would be required.

Industrial Drive / Ingall Street – with link road

The results of the assessment for the AM and PM peak hour in 2034 with the inclusion of the proposed concept traffic are shown in **Table 4-28** and **Table 4-29**.

Table 4-28: 2034 AM Peak Intersection Performance, Industrial Drive / Ingall Street – with development traffic and link road

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Ingall St (S Leg)	176	D	0.622	48.6	53
Industrial Drive (E Leg)	1,282	B	0.660	21.0	153
Ingall St (N Leg)	118	D	0.767	45.3	37
Industrial Drive (W Leg)	2,013	B	0.765	17.6	207
All Vehicles	**3,589**	**B**	**0.769**	**21.2**	**207**

Source: AECOM, 2010

Table 4-29: 2034 PM Peak Intersection Performance, Industrial Drive / Ingall Street – with development traffic and link road

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Ingall St (S Leg)	190	D	0.563	49.9	79
Industrial Drive (E Leg)	1,742	F	0.965	72.4	518
Ingall St (N Leg)	264	F	0.938	73.0	108
Industrial Drive (W Leg)	1,478	C	0.947	34.3	211
All Vehicles	**3,674**	**D**	**0.965**	**56.0**	**518**

Source: AECOM, 2010

The results indicate that the Industrial Drive / Ingall Street intersection is likely to operate satisfactorily at LOS B and with approximately 23% spare capacity in the AM peak hour under the proposed concept scenario. In the PM peak, the intersection is likely to perform close to capacity and at LOS D, which is still considered to be operating acceptably, although this will need to be monitored in the future.

To reduce the impact of the proposed concept on the Ingall Street intersection, diverting employee vehicles exiting the site in the PM peak to the George Street intersection should be considered. Analysis indicates that the Industrial Drive / George Street intersection has spare capacity and therefore this is a viable option.

With this management system in place the Ingall Street intersection is likely to continue to perform at LOS D in the PM peak, however the Ingall Street northern approach and Industrial Drive eastern approach experience improved level of service and increased spare capacity. Diverting all employee traffic to the George Street intersection in the PM peak has a negligible impact on the intersection as this intersection continues to perform satisfactorily at LOS C and with spare capacity. **Table 4-30** and **Table 4-31** show the intersection performance results with this additional management system in place in the PM peak hour.

Table 4-30: 2034 PM Peak Intersection Performance, Industrial Drive / George Street – with link road and employee traffic diversion

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Industrial Drive (S Leg)	1,358	C	0.871	33.8	218
George St (E)	208	C	0.497	38.3	58
Industrial Drive (N Leg)	1,260	B	0.770	24.4	162
George St (W)	58	C	0.074	31.4	10
All Vehicles	**2,884**	**C**	**0.871**	**30.0**	**217**

Source: AECOM, 2010

Table 4-31: 2034 PM Peak Intersection Performance, Industrial Drive / Ingall Street – with link road and employee traffic diversion

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Ingall St (S Leg)	190	D	0.547	50.2	77
Industrial Drive (E Leg)	1,742	D	0.934	51.6	420
Ingall St (N Leg)	228	E	0.916	62.4	81
Industrial Drive (W Leg)	1,478	C	0.922	31.7	189
All Vehicles	**3,638**	**D**	**0.934**	**44.1**	**420**

Source: AECOM, 2010

4.4.2 Broader Road Network Impact Analysis

The impact of the proposed concept generated traffic on the broader road network has been considered at the locations shown in **Figure 4.5**. These are locations where the RTA has annual traffic volume data enabling a comparison to be made between with and without the proposed concept traffic.

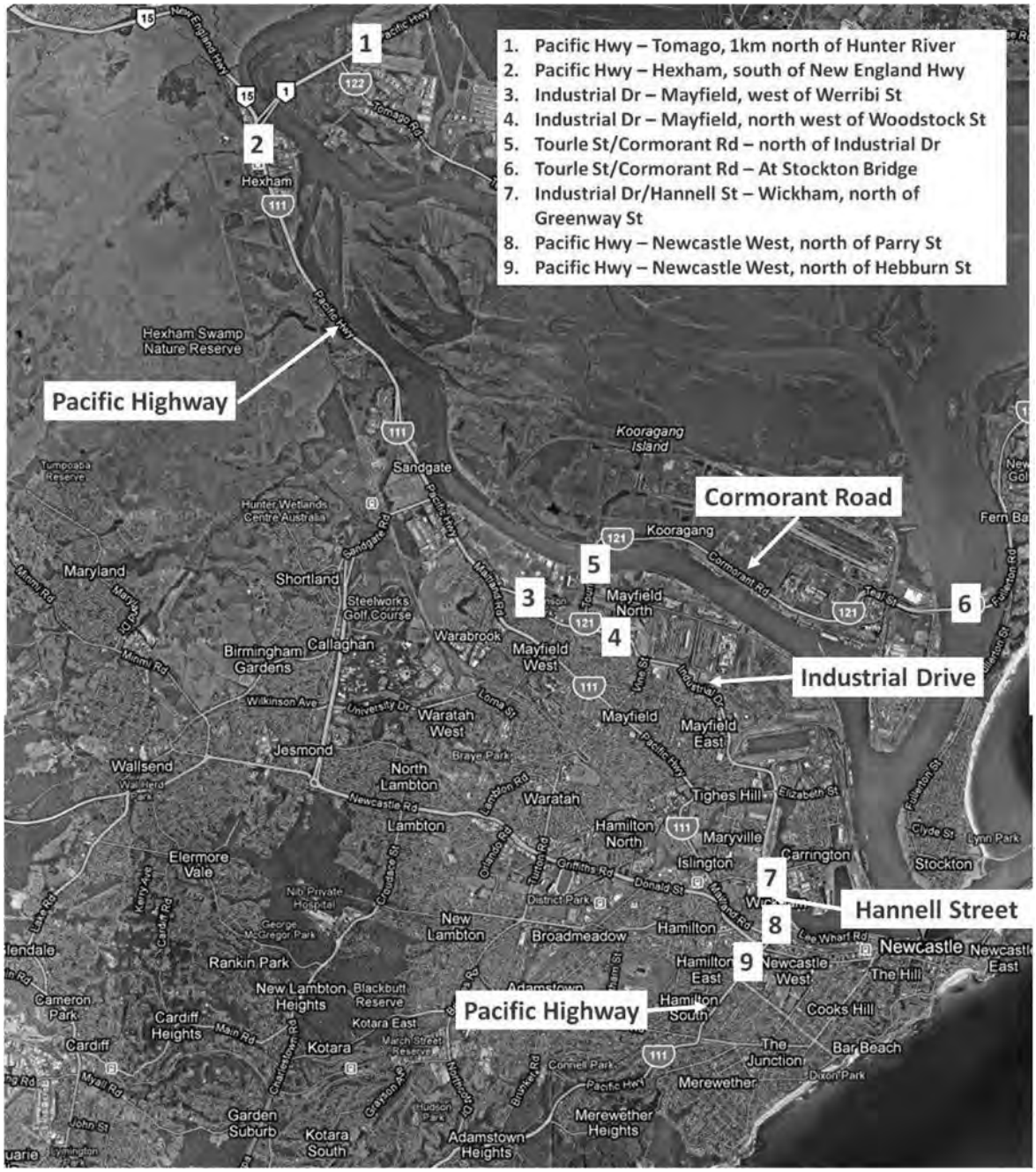


Figure 4-5: Broader Road Network Locations

Source: AECOM, 2009

The proposed concept is expected to generate 1,425 trucks per day (2,850 truck movements per day) and 300 employee vehicles per day (600 employee vehicle movements per day) when complete in 2034, as shown in **Table 4-20**. **Table 4-32** shows the additional truck and vehicle movements as a proportion of the 2034 two-way AADT along roads in the broader road network.

The 2034 two-way AADT was calculated by applying the historical growth factor at each count location. It has been assumed that 80% of truck movements will originate from north of the site and 20% of truck movements will originate from south of the site, as per the assumed distribution in the intersection impact assessment. It has also been assumed that 50% of traffic will access/egress Kooragang Island via Tourle Street and Cormorant Road.

Table 4-32: Development Traffic Movements as a Proportion of 2034 AADT

No.	Road	Location	2034 two-way AADT	Development two-way vehicle movements per day	% of 2034 AADT
1	Pacific Highway	Tomago, 1km north of Hunter River	101,756	690	0.7
2	Pacific Highway	Hexham, south of New England Hwy	86,768	1,380	1.6
3	Industrial Drive	Mayfield, west of Werribi Street	59,641	1,380	2.3
4	Industrial Drive	Mayfield, north-west of Woodstock St	34,188	2,760	8.1
5	Tourle St / Cormorant Rd	Mayfield, north of Industrial Drive	26,386	1,380	5.2
6	Tourle St / Cormorant Rd	At Stockton Bridge	32,158	1,380	4.3
7	Industrial Drive / Hannell St	Wickham, north of Greenway St	51,307	690	1.3
8	Pacific Highway	Newcastle West, north of Parry St	43,737	690	1.6
9	Pacific Highway	Newcastle West, north of Hebburn St	26,175	690	2.6

Source: AECOM, 2010

The table indicates that the trucks and vehicles generated by the proposed concept would be a small proportion (<10%) of the AADT on the broader road network in 2034 and so is considered to have a minimal impact on the broader road network.

4.4.3 Local Road Network Impact Analysis

A detailed assessment of the impact of the Concept Plan on the condition and geometry of the local road network has not been undertaken at this stage. It is recommended that such an assessment should be carried out as part of detailed project applications and that precinct operators be required to demonstrate the impact of heavy goods vehicles on the pavement condition and geometry of the local road network. This would include swept path testing of the type of heavy vehicles that the operators are proposing to use on the access routes in and out of the Concept site.

In regard to the lane capacities of the local road network, in 2034 the maximum predicted peak hour one way traffic flow is in the order of 240 vehicles (150 trucks and 90 employee vehicles) entering the site in the morning peak hour. Using Austroads, Guide to Traffic Management Part 3: Traffic Studies and Analysis 2009, the theoretical capacity of a single traffic lane on the local road is approximately 1,100 vehicles per hour (assuming level grade, 3.7m wide lanes, 2m lateral clearance on each side and 62.5% HGV traffic composition 150 trucks out of 240 vehicles).

With minimal existing traffic on the local roads such as Selwyn Street, the total predicted volume of traffic generated by the proposed concept in 2034 is within the mid-block capacity of the existing local road network and capacity exists to accommodate additional traffic generated by proposed concept of adjoining sites such as Intertrade Industrial Park that may occur in the future.

4.4.4 Impact on Road Network Due to Rail Crossing Closure

The railway line proposed through the site crosses the local road network at locations on Selwyn Street and a new western road / rail level crossing, which would provide access to the north west portion of the site.

Provided the new western level crossing is located more than 65m from the toes of the points for the new rail siding (on the western side), then the locomotives shunting back on the OneSteel road will turn back prior to reaching the level crossing, meaning that the only rail traffic crossing the new level crossing will be OneSteel traffic. This crossing will be closed for approximately 2-3 minutes while trains enter or leave the OneSteel site.

For the Selwyn Street level crossings, two scenarios are possible. Approximately 80% of the time, it is expected that trains entering Mayfield would travel through the level crossing and be broken up in the new rail sidings within the port site. This will mean a closure of approximately 5-6 mins while trains enter or leave the Mayfield site. For the other 20% of the time, if the new rail sidings are occupied, then trains may have to be held and broken up in the Morandoo Sidings (number 4 and 5 roads) outside of the Mayfield site, and brought in one half at a time, as follows:

- locomotives will bring in the first half of the train, (closing the level crossings for approximately 2-3 minutes);
- crossing will be open for at least 10-15 minutes;
- locomotives will return to Morandoo Sidings (closure of 2-3 minutes),
- crossing will be open for at least 10-15 minutes;
- locomotives will pull in the second half (closure of 2-3 minutes); and
- after the train has been loaded (which could take up to 5 hours, during which the crossing will be open), the train will be reformed within the Mayfield site and the whole train shunted back out again (shunting manoeuvres are expected to close the crossings for approximately 5-6 minutes).

Queues will build up during these closures; however, the gap between closures is expected to be in excess of 10 to 15 minutes, which will allow the queue to dissipate before the next closure occurs. As a worst case scenario, a maximum closure time of 6 minutes has been assumed and tested.

The redevelopment is expected to generate a total of 71 truck movements per day time hour and 214 truck movements per peak hour. Of the AM and PM peak hour truck movements, 121 and 69 respectively are assumed to use the Ingall Street / Industrial Drive intersection, while 29 truck movements are assumed to use the George Street / Industrial Drive intersection in the AM peak hour and 16 truck movements in the PM peak hour. This is based on the initial assumption that the Container Terminal truck traffic will use the Ingall Street intersection, which is a worst case scenario for the new western crossing.

As a worst case scenario for the Selwyn Street crossing, it was re-analysed with the link road in place and the Container Terminal truck traffic using the George Street intersection. The impact on the western crossing would be greatly reduced as the traffic volume is greatly reduced by redirection of the Container Terminal truck traffic.

Table 4-33 shows the resulting number of trucks per minute at each intersection during the peak hours and associated queue lengths assuming the rail crossings are blocked for a maximum of 6 minutes and a standard truck length of 12.5m.

Table 4-33: Rail Crossing Queue Lengths

Intersection	Truck Movements per peak hour	Truck Movements per minute [1]	Queue length (trucks)	Queue length (m)
New western crossing AM peak hour	121	2	12	150
New western crossing PM peak hour	69	2	12	150
Selwyn Street AM peak hour	29	1	6	75
Selwyn Street PM peak hour	16	1	6	75
Selwyn Street AM peak hour (with link road)	144	3	18	225
Selwyn Street PM peak hour (with link road)	82	2	12	150

Source: AECOM, 2010

[1] Truck movements per minute are rounded up to the nearest whole truck.

From the above table the maximum queue length at the Selwyn Street and western crossings are expected to be 75m and 150m respectively, although the queue length at Selwyn Street would increase to 225m if a link road was introduced. On the basis of this analysis the closing of the rail crossings is not expected to have an impact on the George Street / Industrial Drive intersection and Ingall Street / Industrial Drive intersection in either peak hour as they are 600m and 750m from the rail crossings respectively, as seen in **Figure 4-6**.

Queuing within the site will need to be managed within the internal road network. Traffic planning for the proposed Intertrade Industrial Park will also need to be cognisant of queuing traffic from the level crossings in terms of access in and out of this site. This may be managed through road markings, lane widening to accommodate truck queues or active traffic management.



Figure 4-6: Rail Crossing and Distance from Intersections

Source: AECOM, 2009

4.4.5 Rail Network

Rail Impacts

This section should be read in conjunction with **Section 4.3.3** and **Table 4.19**.

The increase in container freight operations to 1 million TEU under the final operations condition (2034) requires the addition of 1.3 additional freight trains per day into the port. The total number of trains now entering the sidings will be 4.4 trains per day. This means that the sidings will be occupied for 21 hours of each day.

There is an increased risk that, due to the curfew on the Main North line, trains will stack up at the port. A likely scenario is that a train arrives before the morning curfew (7am) and enters the sidings. A second arrives 4 hours later (11am) and holds for 2 hours waiting to enter the sidings. A third then arrives 4 hours later (3pm) and holds for 2 hours waiting to enter the sidings. This last train of the day will load up and leave after the curfew.

Once the Northern Sydney Freight Corridor (NSFC) is in operation, this will no longer be an issue, as trains can be timetabled to arrive at the correct time of day for entry into the port without holding on the Morandoo Siding.

It is worth noting that the NSFC is currently being implemented, therefore it is likely that this project will be in place before the port facility reaches the 1 million TEU case in 2034.

Rail Mode Share Sensitivity Testing

It is assumed for the purposes of the 2034 case that the NSFC has been built. The number of trains able to access the port becomes (to all intents and purposes) unrestricted, and train lengths improve up to the limit of the siding space available in the Mayfield site. This is because the gradients on the Cowan Bank will be improved and the trains can be lengthened. This equates to a 12% increase in handling capacity per train.

The sensitivity test of the 1 million TEU per annum case is shown in **Table 4-34**. The numbers presented are trains per day based on the above assumptions. The base case of 4.4 trains has been improved to 3.9 trains due to the above 12% increase in handling capacity per train.

Table 4-34: 2034 Rail Mode Share Sensitivity Testing

1,000,000TEU (NSFC built)	Bulk 30% by Rail	Bulk 50% by Rail	Notes
Container 20% by Rail	3.9#	4.6	Intertrade Industrial Park required for 50% bulk.
Container 40% by Rail	6.9	7.5	Intertrade Industrial Park required. Will substantially affect delivery of coal to Port Waratah Loop, and grain to Bullock Island and Carrington. Large infrastructure investment required to accommodate.

This is the base case modelled scenario

All figures in the above table assume a 12% increase in handling capacity per train after completion of the NSFC

Source: AECOM, 2010

The base case for the 1 million TEU can be moved by rail after completion of the NSFC. However, it is clear that changing modal splits for freight demand associated with the 1 million TEU case presents significant difficulty for the rail infrastructure within the port site and for other local rail operators.

Increasing the container task to 40% and the bulk tasks to 50% of the demand would require substantial capital investment in the infrastructure side. Further study and discussions would be required in order to properly define the impacts to all local rail operators (Port Waratah, Bullock Island, Morandoo, OneSteel, and Carrington).

5.0 Summary and Conclusions

5.1 Introduction

AECOM has been engaged to provide input in regards to road and rail traffic for an Environmental Assessment of the Concept Plan for the proposed redevelopment of Newcastle Port Corporation (NPC) land in Mayfield, Newcastle over the next 25 years.

The proposed development consists of five precincts: General Purpose, Bulk Liquid, Bulk and General Purpose, Container and NPC Operations.

5.2 Road Network Impacts

5.2.1 Operational Traffic

It has been assumed that the proposed development will be accessed from the Industrial Drive / George Street and Industrial Drive / Ingall Street intersections.

Based on the expected trade forecasts and modal splits provided by NPC, the development as a whole is predicted to produce 148 truck movements and 60 vehicle (car) movements in the day time peak hour under the proposed initial operations (2024) and 214 truck movements and 90 vehicle (car) movements in the day time peak hour under the proposed final operations (2034). The breakdown of truck and vehicle movements per precinct is shown in **Table 5-1**.

Table 5-1: Truck and Car Movements per Precinct

Precinct	Truck movements per peak hour (daytime)		Car movements per peak hour (daytime)	
	Initial Operations (2024)	**Final Operations (2034)**	**Initial Operations (2024)**	**Final Operations (2034)**
Bulk and General	24	24	-	-
General Purpose	16	16	-	-
Container Terminal	99	165	-	-
Bulk Liquid	9	9	-	-
Employees	-	-	60	90
Total	**148**	**214**	**60**	**90**

Source: AECOM, 2010

The road access intersections have been initially assessed under four scenarios to determine the impact of the development generated traffic on the road network:

- Existing conditions (2008);
- Future conditions without development traffic (2024 and 2034);
- Future conditions with development traffic (2024) – Proposed initial operations; and
- Future conditions with development traffic (2034) – Proposed final operations.

Based on the concept plan, it was initially assumed that the Container Terminal Precinct and Bulk Liquid Precinct will be accessed via the Industrial Drive / Ingall Street intersection and the General Purpose Precinct, Bulk and General Precinct and NCP Operations Precinct will be accessed via the Industrial Drive / George Street intersection. However, initial analysis indicated that in the PM peak under the future 2024 scenario with development, the Industrial Drive / Ingall Street intersection did not perform satisfactorily (LOS F and a degree of saturation greater than 1). This was mainly due to the large number of vehicles from the Container Terminal Precinct predicted to use the Ingall Street / Industrial Drive intersection for access.

Therefore, it is recommended that a link road within or external to the site be created (in conjunction with a traffic management system) which allows traffic from the Container Terminal Precinct to be redirected to the Industrial Drive / George Street intersection which has additional capacity.

Table 5-2 and **Table 5-3** show a comparison of the intersection performances under different scenarios with the internal link road present, and the Container Terminal Precinct traffic using the Industrial Drive / George Street intersection.

Table 5-2: Industrial Drive / George Street Intersection – Scenario Analysis

Scenario		Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
AM Peak	Existing Conditions	2,152	B	0.722	19.9	151
	Future conditions without development (2024)	2,246	B	0.754	20.7	164
	Future conditions without development (2034)	2,304	B	0.773	21.3	172
	Future conditions with development (and link road) (2024)	2,608	B	0.823	23.9	198
	Future conditions with development (and link road) (2034)	2,756	B	0.845	25.5	213
PM Peak	Existing Conditions	2,244	B	0.748	22.6	154
	Future conditions without development (2024)	2,343	B	0.785	23.6	167
	Future conditions without development (2034)	2,404	B	0.800	24.3	175
	Future conditions with development (and link road) (2024)	2,706	B	0.851	27.8	201
	Future conditions with development (and link road) (2034)	2,848	C	0.871	29.9	217

Source: AECOM, 2010

The results indicate that while the initial and final operations development generated traffic has a slight impact in terms of DoS, average delay and queue length, the overall LOS in the AM and PM peaks remains acceptable at the Industrial Drive / George Street intersection.

Table 5-3: Industrial Drive / Ingall Street Intersection – Scenario Analysis

Scenario		Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
AM Peak	Existing Conditions	3,073	B	0.651	19.6	160
	Future conditions without development (2024)	3,208	B	0.708	19.7	166
	Future conditions without development (2034)	3,287	B	0.714	20.2	177
	Future conditions with development (and link road) (2024)	3,479	B	0.745	21.0	196
	Future conditions with development (and link road) (2034)	3,589	B	0.769	21.2	207
PM Peak	Existing Conditions	3,141	B	0.818	26.9	223
	Future conditions without development (2024)	3,280	C	0.873	30.9	268
	Future conditions without development (2034)	3,361	C	0.894	33.2	293
	Future conditions with development (and link road) (2024)	3,558	B	0.854	26.7	264
	Future conditions with development (and link road) (2034)	3,674	D	0.965	56.0	518

Source: AECOM, 2010

With an internal link road and Traffic Management Plan (TMP), the level of service remains at LOS B in the future 2024 AM peak scenario with proposed initial operations development traffic and in the 2034 AM peak scenario with proposed final operations. In the PM peak, the level of service is predicted to be LOS B in 2024 and to decline to LOS D in 2034 with proposed final operations and the intersection will operate close to capacity. This is satisfactory in terms of intersection performance; however, by introducing a TMP in the PM peak to divert employee traffic towards the George Street intersection, the intersection would perform with greater spare capacity.

While the above TMP allows the intersection to function satisfactorily, there may be other management options that would still allow the intersections to operate within satisfactory performance criteria. Precinct operators should not be prohibited from deviating from the above TMP, as long as they can demonstrate that the intersections operate satisfactorily under a different management option.

The volume of traffic predicted from the development has shown to be within the mid-block lane capacity of the surrounding road network and capacity exists to accommodate additional traffic generated by development of adjoining sites such as Intertrade Industrial Park that may occur in the future.

The truck queueing associated with operation of the railway crossings has also been demonstrated to be within the capacity of the local road network, although impacts on the local road network and access to adjoining properties in the Mayfield precinct will need to be managed.

5.2.2 Construction Traffic

The impact of construction traffic has not been assessed as part of this assessment due to details of the exact nature of the infrastructure required on site being unknown. However, it is anticipated that daily construction traffic would not exceed daily traffic predicted for the proposed 2024 initial operations, which are shown to be within the capacity of the access intersections and are not predicted to have a significant impact on the proximal road network.

Further detailed assessment should be dealt with as part of the future project applications for the construction and operation of the individual terminals/precincts, when these are made by the prospective operators of the facilities. Construction Management Plans should be implemented to ensure impact of construction traffic to the road network is limited.

5.3 Rail Network Impacts

Given the train loading and unloading times and based on the fact that there are 3.9 trains per day for final operations in 2034 (up to 1 million TEU of containers per annum) then sufficient time must be allowed for OneSteel trains to move in and out of their facility. As a result, there needs to be a minimum of two 520m sidings created within the port site.

The envisaged operation is that a maximum length of 766m train will be pulled into the site, and then broken into two and shunted into the two 520m sidings for loading and unloading. The train is then reformed after loading, in the same manner, before leaving via the new exit road to the Bullock Island Loop.

In this configuration the train can be pulled into the site and internal shunting manoeuvres can occur without unduly impacting on the Selwyn Street railway crossing or the new western road crossing of the railway line that will be required to service the Container Terminal Precinct and Bulk Liquid Precinct.

At the final operations scenario in 2034 (up to 1 million TEU per annum) and 3.9 trains per day, it may be necessary to use the Morandoo Siding to park a train while waiting for the above shunting and loading and unloading operations to be completed. As the use of this siding may temporarily block rail access to the OneSteel site, it is suggested that this should be discussed and agreed with OneSteel.

Alternatively the timeframe for reaching the final operations scenario may be such that the North Sydney Freight Corridor project has been completed and therefore the current curfew restrictions on the operation of the Main North Line would be removed. If so, this is likely to remove the need to use the Morandoo Siding to park a train.

At initial operations scenario in 2024 (up to 600,000 TEU of containers per annum) and 3 trains per day, similar infrastructure requirements to those described above will be required but there should be no need to block the Morandoo Arrival Road.

For the initial operations scenario in 2024 up to 2 trains per day can be handled at the port by trains exiting the site via a reverse manoeuvre back over the Selwyn Street level crossing and into the Morandoo Sidings (number 6 road). From there they would then leave in a forward direction via the Port Waratah Loop.

Once more than 2 trains per day are required, then it is likely than an exit road from the Mayfield site to the Bullock Island Loop will be required to allow more efficient operation of the train movements.

Constraints that exist are:

- OneSteel requires access to their facility, therefore the Morandoo Arrival Road and the OneSteel Arrival Road (number 13 road) need to be kept clear;
- Within the Morandoo Sidings the number 6 and 7 roads need to be connected via a new crossover so as to provide access to the OneSteel Arrival Road;
- Selwyn Street level crossing sits between the Morandoo siding and the site. The level crossing will be closed for only relatively short periods of time (5-6 minutes per train movement) while trains enter and exit the port. The design of the internal sidings means that this crossing will not be impacted by shunting manoeuvres. This crossing will likely need to become a full barrier as a minimum;
- The new western road crossing of the railway line that will be required to service the Container Terminal and Bulk Liquid Precincts may also require a suitable treatment to separate road and rail movements (OneSteel trains);

- The Main North Line operates under a freight train curfew during the peak hours. This means that running trains between Newcastle and Sydney needs to be carefully planned. It is quite possible that this curfew will cause path restrictions to Newcastle. This issue should be discussed with ARTC and RailCorp;
- This freight train curfew will be removed when the Main North Corridor Upgrade project is completed but this is likely to occur in a medium/longer term timeframe; and
- Use of the Morandoo Arrival Road will require a discussion to take place with Pacific National to ensure that the siding is available for use.

5.4 Conclusion

The likely future road network impacts are:

- Industrial Drive / George Street intersection appears to operate satisfactorily in the future under both initial (600,000 TEU per annum) and final operations development (1 million TEU per annum) scenarios;
- Industrial Drive / Ingall Street intersection is likely to exceed capacity in the PM peak hour under the proposed initial operations development scenario (2024), while operating satisfactorily in the AM peak hour;
- Industrial Drive / Ingall Street intersection appears to operate satisfactorily in the future under initial and final operation development scenarios (2024 and 2034) if an internal link road between the precincts and a Traffic Management Plan (TMP) is implemented to channel more traffic to the Industrial / George Street intersection which has available capacity.

These conclusions are based on the assumptions on trip generation, distribution and assignment available at the concept plan phase. These assumptions can be reviewed to test their appropriateness at the more detailed project application phase once more detailed information is available.

The majority of thel impact on the Ingall Street intersection is due to all of the Container Terminal traffic using the intersection for access. It is recommended that a link road in the internal or external road network be introduced to enable this traffic to be redirected to the George Street intersection, allowing use of the available road capacity. It is recommended that a TMP is developed for the entire site to ensure that this distribution is enforced. Alternative management options may also be viable provided that it can be demonstrated that the intersections can still operate satisfactorily.

The volume of traffic from the proposed Concept Plan is predicted to be within the mid-block capacity of the local road network. The truck queueing associated with operation of the railway crossings has also been demonstrated to be within the capacity of the local road network, although impacts on the local road network and access to adjoining properties in the Mayfield precinct will need to be managed.

It is recommended that as part of detailed project applications, precinct operators should be required to assess the impact of heavy goods vehicles on the road pavement condition of the local road network and confirm that the types of vehicles proposed for use can be accommodated with the road geometry.

Workplace Travel Plans should be considered in the future project applications for the individual terminals/precincts, when these are made by the prospective operators of the facilities, with attention given to access by walking, cycling and public transport. This would reduce the impact made by employee traffic.

The likely future rail impacts are:

- Two new 520m rail sidings will be required in the port separated to allow reach stacker movement either side of wagons and the sidings need to be connected at both ends to allow shunt manoeuvres (initial operations);
- A new crossover to be installed between number 6 and 7 roads in the Morandoo Sidings (required for initial operations);
- The existing OneSteel siding may need to be re-signalled to allow multiple train movements (required for initial operations);
- The Selwyn Street railway crossing will need to be assessed for treatment to separate rail and road movements, although a full barrier will likely be required (required for initial operations);

- The new western road crossing of the railway line that will be required to service the Container Terminal and Bulk Liquid Precincts may also require a suitable treatment to separate road and rail movements (required for initial operations);
- It is likely that an exit road from the Mayfield site onto the Bullock Island Loop will be required once more than 2 trains per day can be run.

There is no impact to the current operation of the Port Waratah rail facilities, or to OneSteel, in the initial operations scenario (600,000 TEU per annum), and minor impacts to OneSteel in the final operations scenario (1 million TEU per annum). These impacts can be overcome by agreeing a timetable of operation within the Morandoo Siding and OneSteel Arrival Road, and no further infrastructure is likely to be required.

Should there be changes to the modal splits for freight demand beyond the base cases that have been modelled then further assessment of the rail impacts will be required and further upgrades to rail infrastructure within the Mayfield site and on the local rail network would in all likelihood be required.

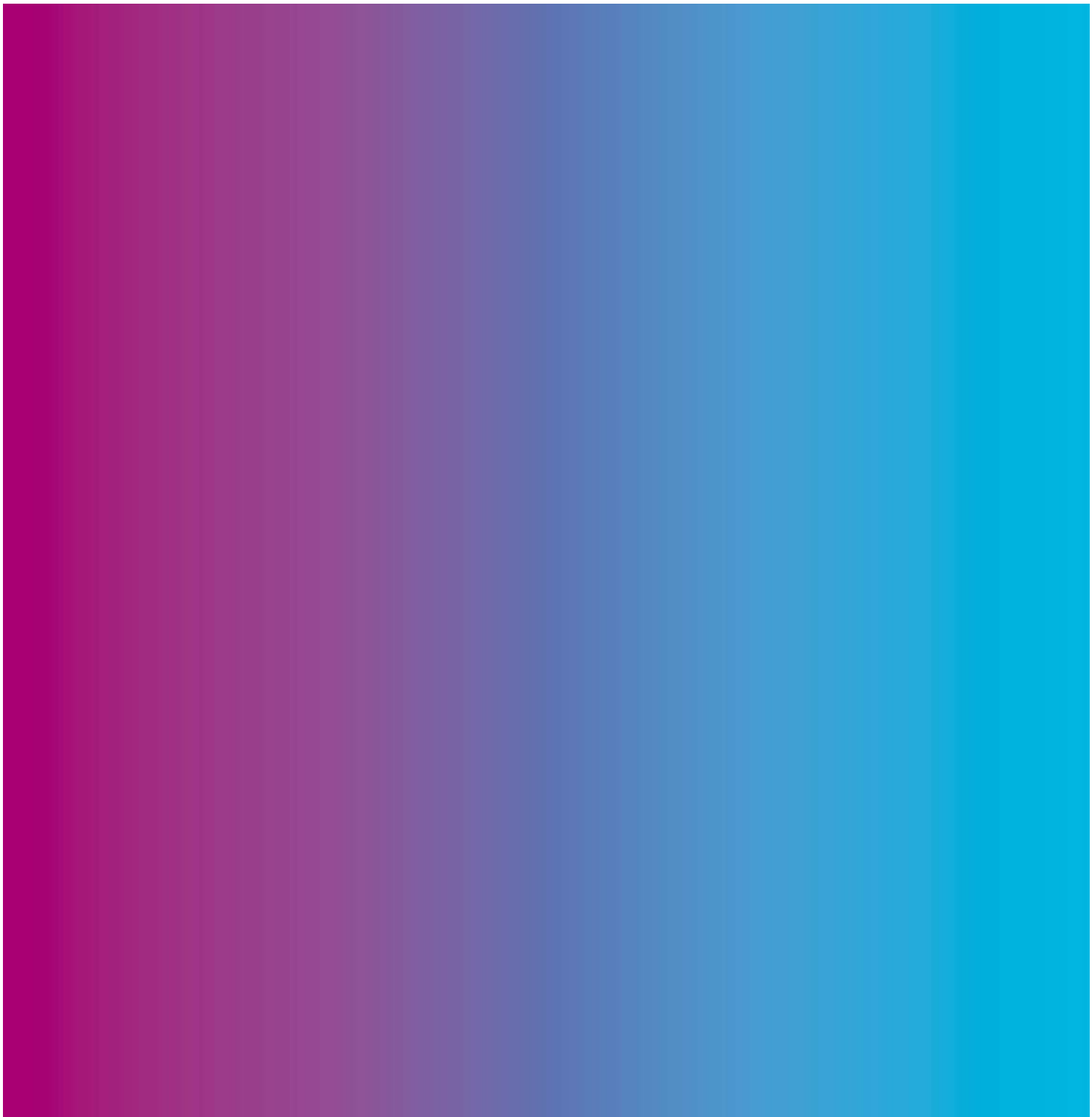
Appendix E

Preliminary Hazard Assessment

Appendix E Preliminary Hazard Assessment

Bulk Fuel Storage Facility
Marstel Terminals Pty Ltd
27 June 2011

Preliminary Hazard Analysis



Preliminary Hazard Analysis

Prepared for

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Document Preliminary Hazard Analysis

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Table of Contents

1.0 Hazard Analysis 1
1.1 Introduction 1
1.2 Objectives 1
1.3 Scope of the Assessment 1
2.0 Methodology 3
2.1 Application of SEPP33 3
2.2 Assessment Approach 3
3.0 Brief Description of the Proposed Terminal 5
3.1 Site Location and Surrounding Land Use 5
3.2 General Site Operations 8
3.2.1 Liquids Unloading Berth – NPC Wharf (Mayfield 3.5) 8
3.2.2 Pipeline Transfer Diesel Fuel – Mayfield 3.5 Berth to Marstel Terminal 8
3.2.3 Tank Storages –Marstel Terminal 11
3.2.4 Tanker Filling Facilities – Tanker Loading Bays & Gantries 12
3.2.5 Ancillary Facilities 12
3.3 Summary of Terminal Safety Features 12
3.3.1 Liquids Unloading Berth – NPC Wharf 12
3.3.2 Transfer Pipeline 13
3.3.3 Storage Tanks 13
3.3.4 Loading Bays/Gantries 13
3.3.5 Fire Safety Systems 13
4.0 Hazard Analysis and Risk Assessment 15
4.1 Types and Quantities of Dangerous Goods Stored at the Site 15
4.2 Bulk Diesel Delivery – NPC Wharf (Mayfield 3.5) 15
4.3 Bulk Fuel Transfer – NPC Wharf (Mayfield 3.5) to Terminal 16
4.4 Terminal Storage Tanks and Associated Equipment 17
4.5 Tanker Loading, Transfer Pumps and Associated Pipework 18
4.6 Loading Bays and Gantries – Fuel Tanker Loading 18
5.0 Conclusions and Recommendations 21
5.1 Conclusions 21
5.2 Recommendations 21
6.0 References 27

List of Tables

Table 3 Hazard Identification Table 23

List of Figures

Figure 1 Regional Location 6
Figure 2 Site Location 7
Figure 3 Site Layout 10

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1.0 Hazard Analysis

1.1 Introduction

Marstel Terminals Newcastle Pty Ltd (Marstel) proposes to construct and operate a bulk liquids terminal at Mayfield North, Newcastle, New South Wales to store and handle diesel and biodiesel fuels. As the facility will store combustible liquids (diesel fuel), there is a potential that *State Environmental Planning Policy No.33, Hazardous and Offensive Developments* (SEPP33), could apply to the site. Under this policy it may be necessary to demonstrate that the site is not Hazardous and/or Offensive.

Notwithstanding this, as combustible liquids will be stored and handled at the site it will be necessary to review the hazards associated with the storage and handling of these materials, the proposed safeguards and their effectiveness in managing the hazards and risks. This Preliminary Hazard Analysis details the hazard analysis conducted for the proposed Marstel terminal.

1.2 Objectives

The objective of the study is to identify hazards associated with the proposed Marstel Terminal and to determine the effectiveness of safeguards at the proposed site in maintaining these hazards in the as low as reasonably practicable (ALARP) range.

1.3 Scope of the Assessment

The scope of the assessment is for a hazard analysis of the proposed Marstel Terminal using a qualitative approach as recommended in the *Applying SEPP33 Hazardous and Offensive Development Guidelines* (Ref.1). This is further discussed in the section 2.1.

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2.0 Methodology

2.1 Application of SEPP33

A review of *Applying SEPP33* (Ref.1) indicates that diesel and biodiesel are not classified as Dangerous Goods subject to SEPP33 requirements. The extract below, from Page 20 of Applying SEPP33 describes:

"Note: LPG automotive retail outlets fall within SEPP 33 but procedures for dealing with them are not covered in these guidelines. The required PHA should demonstrate to the consent authority compliance with the Department of Planning publication 'Hazardous Industry Locational Guidelines No 1 – Liquefied Petroleum Gas Automotive Retail Outlets'.

If class C1 and/or class C2 are present on site and are stored in a separate bund or within a storage area where they are the only flammable liquid present they are not considered to be potentially hazardous. If, however, they are stored with other flammable liquids, that is, class 3PGI, II or…"

It is proposed that diesel and biodiesel would be stored and handled at the proposed bulk liquids terminal facility. Diesel is classified as C1 and biodiesel as C1 or C2 depending on its composition. Based on this review, SEPP33 is not applicable to the site.

2.2 Assessment Approach

Notwithstanding the above assessment, the document "Applying SEPP 33" (Ref.1) guideline may be used to assist in the selection of the appropriate level of hazard analysis and risk assessment. The guideline states the following:

"It is considered that a qualitative PHA may be sufficient in the following circumstances:

- *where materials are relatively non-hazardous (for example corrosive substances and some classes of flammables);*
- *where the quantity of materials used are relatively small;*
- *where the technical and management safeguards are self-evident and readily implemented; and*
- *where the surrounding land uses are relatively non-sensitive.*

In these cases, it may be appropriate for a PHA to be relatively simple. Such a PHA should:

- *identify the types and quantities of all dangerous goods to be stored and used;*
- *describe the storage/processing activities that will involve these materials;*
- *identify accident scenarios and hazardous incidents that could occur (in some cases, it would also be appropriate to include consequence distances for hazardous events);*
- *consider surrounding land uses (identify any nearby uses of particular sensitivity); and*
- *identify safeguards that can be adopted (including technical, operational and organisational), and assess their adequacy (having regards to the above matters).*

A sound qualitative PHA which addresses the above matters could, for some proposals, provide the consent authority with sufficient information to form a judgement about the level of risk involved in a particular proposal".

The proposed Marstel terminal will store and handle diesel and biodiesel fuels only, which are relatively low hazard/risk materials. The facility will be located in a heavily industrialised area on land previously occupied by the BHP Steelworks in Mayfield, NSW. Sensitive land users are well clear of the site, the closest residential buildings being over 900m to the south in the Mayfield East area. Detailed technical and management safeguards are proposed for the Marstel terminal and under these circumstances, a qualitative assessment would be considered appropriate for the project.

The qualitative analysis has followed the recommended approach in Applying SEPP33 (Ref.1) listed above.

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3.0 Brief Description of the Proposed Terminal

3.1 Site Location and Surrounding Land Use

The Marstel terminal is located on the southern bank of the Hunter River in Mayfield North, Newcastle, NSW. A regional location of the site is shown at Figure 1. The proposed land is zoned SP1 Special Activities under State Environmental Planning Policy (Major Development) 2005 as part of the Newcastle Port Site. The proposed facility would thus require environmental assessment under Part 5 of the EP&A Act in order for the project to proceed. The facility currently has only one industrial site within relatively close proximity, the remaining adjacent areas are undeveloped or, in the case of the area to the north, is the bank of the Hunter River. The surrounding facilities are listed below:

- **East** – currently vacant land, previously BHP Steelworks, Newcastle;
- **North** – Koppers pipeline, currently vacant land[1] and Hunter River;
- **West** – OneSteel steel tube, pipe and wire; and
- **South** – currently vacant land, with a residential area over 900m to the south.

The location of these facilities in relation to the proposed Marstel terminal site is shown on Figure 2. As noted above, the closest zoned residential area is located to the south, 900m from the site and across Industrial Drive, Mayfield East.

The proposed wharf for the unloading of the liquids is located about 1km to the east of the terminal. The area adjacent to the wharf is currently vacant land, which was at one time the BHP Steelworks, Newcastle.

[1] Land is leased by Marstel and will remain undeveloped.



G:\Projects\602 Projects\60212465 Marstel Terminal REP\FIGURES\60212465 F1 Regional Context 03 06 2011 TO

AECOM

REGIONAL CONTEXT

Review of Environmental Factors
Port of Newcastle, New South Wales

FIGURE 1



G:\Projects\602 Projects\60212465 Marstel Terminal REP\FIGURES\60212465 F2 Site Location 06 06 2011 TO

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SITE LOCATION

Review of Environmental Factors
Port of Newcastle, New South Wales

FIGURE 2

3.2 General Site Operations

Figure 3 shows the proposed layout of the Marstel terminal. As noted above, the diesel fuel will be unloaded from the berth located at the wharf about 1km to the east of the proposed site location. A pipeline will be used to transfer the majority of product from ships to the tanks. The fuel will be loaded to the tanks by the terminal operators. Road tankers will also be used to deliver the diesel to customers in the Newcastle and regional areas. The road tankers will be loaded using the dedicated loading bays installed on the western side of the site.

Marstel is seeking planning approval to operate the site 24 hours per day, 7 days per week.

Detailed description of each section of the proposed terminal is presented in the following sections.

3.2.1 Liquids Unloading Berth – NPC Wharf (Mayfield 3.5)

Marstel proposes to use the refurbished NPC wharf (Mayfield 3.5), east of the existing Koppers berth located about 1km to the east of the proposed terminal location in Mayfield North.

Bulk liquid tankers will travel from other ports in Australia and overseas and enter the Hunter River directly on arrival at the Newcastle port. Oil Tanker delivery planning will obviate the need for tankers to anchor off the port, resulting in the potential for a ship grounding hazard in heavy seas. Once the tanker approaches the port it will be met by a port pilot, who will assist with the navigation duties whilst entering and traversing the Newcastle port entry and Hunter River environs. As the tanker approaches the wharf it will be met by tugs that will be used to assist the berthing of the vessel. Key hazard reduction and safety features of this method of harbour entry and berthing are:

- Tanker does not anchor offshore, eliminating the potential for the ship to be driven on the coast by heavy seas;
- Pilot assisted navigation entering and in the harbour, which eliminates the hazard of unfamiliarity with the harbour entry and port navigation requirements; and
- Tug assistance in berthing, which reduces the risk of striking the wharf and damaging the tanker hull leading to release.

The liquids transfer system will consist of the following:

- A ship-side system with a pump and transfer pipework from the ship tanks to the transfer manifold on the ship's deck. The pumps on the ship will transfer the diesel fuel product at a maximum 9 bar pressure. At the transfer manifold, on the ship's deck, two valves will be installed; both manual isolation. The ship's operator will be adjacent to the pump emergency shutdown button, which can be activated to isolate delivery in the event of any incidents.
- Two flexible hoses (each 200mm diam.) connected between the ship and shore facility will be used for the transfer of diesel fuel product. The hoses will be made from steel reinforced rubber with a rating of 14 bar. The hoses will be tested at manufacture, and during operation, in accordance with the requirements of the Australian Dangerous Goods Code (Ref.2). The connections at each end of the flexible hose will incorporate in-line butterfly valves to eliminate the potential for any minor releases when the flexible hose is disconnected.
- Shore side facilities, including a flexible hose connection to the shore manifold and two valves (manual and non-return)

Ships will arrive at the berth and tie-up at the northern part of the wharf. The flexible hose will be connected to the ship and wharf pipelines and the valves configured to permit the transfer of liquids from the ship to the terminal. Once the delivery valve has been confirmed by the terminal and ships staff, the ships product transfer is commenced.

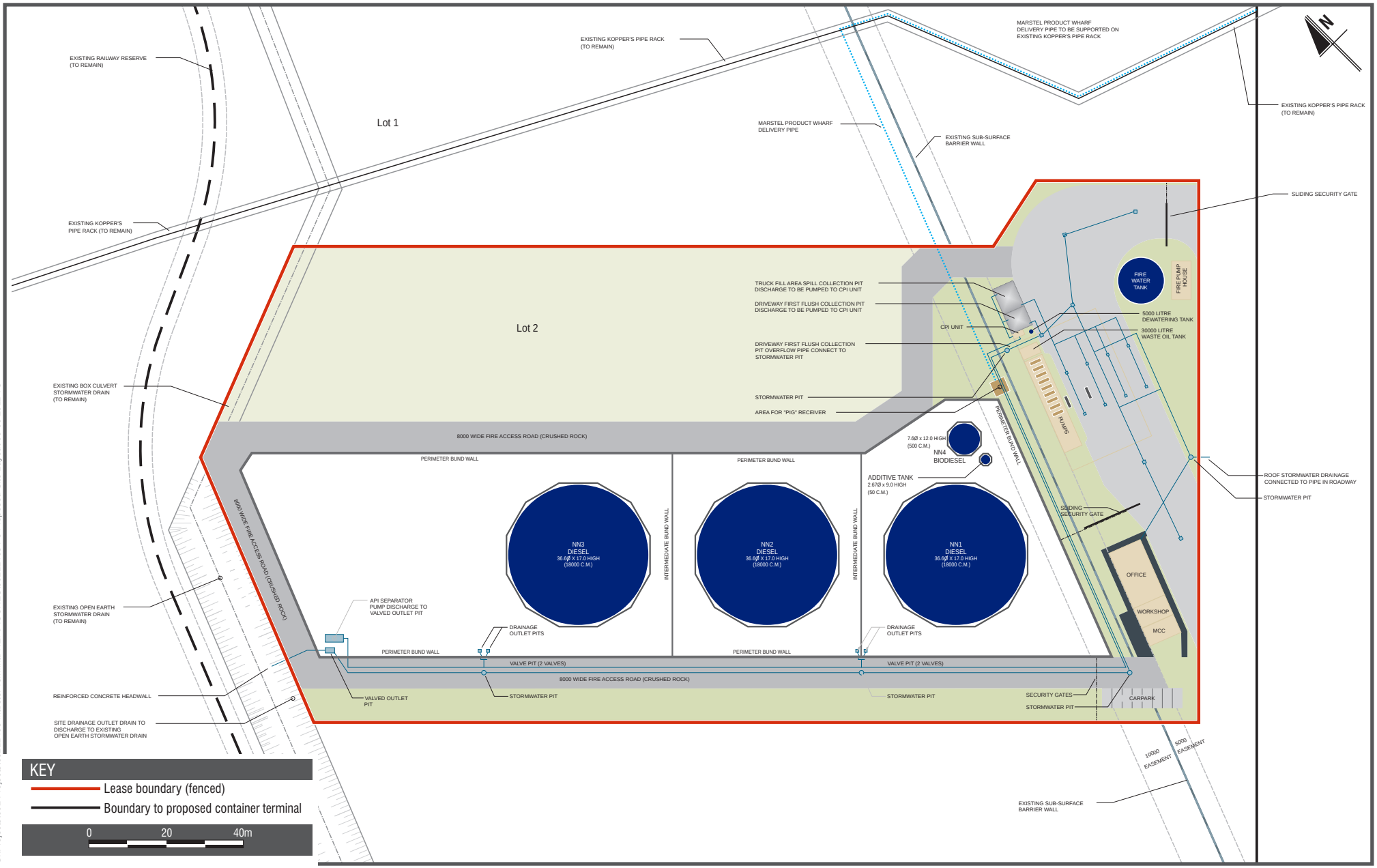
3.2.2 Pipeline Transfer Diesel Fuel – Mayfield 3.5 Berth to Marstel Terminal

The pipeline for transfer of the diesel fuel will be aboveground between the liquids transfer berth and the terminal. The pipework will be located under an existing gantry that is constructed between the wharf and the Koppers facility to the west of the proposed terminal.

The pipeline will be 400mm in diameter and will be fully welded along its entire length. The pipeline construction will involve full weld non-destructive testing (NDT) including, for example, x-ray and magnetic particle testing. The pipeline will be fitted with "pigging" equipment to enable pipeline clearing, cleaning and testing during its lifetime.

Once the ship has established connection to the ship and wharf fittings, and the delivery systems confirmed to be in the correct position, the ships pumps will be started and the product transferred from the ship to the terminal tanks via the pipeline. The flow and tank levels will be continually monitored by ship and shore (terminal) based monitoring and control systems ensure product transfer continues successfully.

On completion of the transfer, the ships pumps will be stopped and the transfer ceased. The flexible hose will be drained to the wharf pipeline and the inline butterfly valves closed to isolate any product remaining in the hose, eliminating minor spills at the disconnection point. The pipeline will then be cleared using a “pig” to transfer the fuel within the pipeline to the terminal. The pipeline will remain empty until required for the next transfer of diesel from the wharf to the terminal.



G:\Projects\602 Projects\60212465 Marstel Terminal REF\FIGURES\60212465 F3 Proposed Site Layout 06 06 2011 TO

AECOM

PROPOSED SITE LAYOUT

Review of Environmental Factors
Port of Newcastle, New South Wales

FIGURE 3

3.2.3 Tank Storages –Marstel Terminal

As shown in Figure 3, there are a total of 5 tanks installed at the terminal, containing combustible liquids (diesel and biodiesel) and diesel additives (non-DG). The tanks will be manufactured from welded steel construction and installed in bunds. Within the main bund there are intermediate bund walls to segregate the tanks as required by AS1940-2004 (Ref.3). Table 1 lists the tanks, materials stored, storage quantities and dimensions.

Table 1 Types and Quantities of DGs stored at the Site

Tank No	Material Stored	Class	Tank Size	Capacity
NN1	Combustible Liquid - Diesel	C1	36m Diam. X 17m high	18,000 m^3
NN2	Combustible Liquid - Diesel	C1	36m Diam. X 17m high	18,000 m^3
NN3	Combustible Liquid - Diesel	C1	36m Diam. X 17m high	18,000 m^3
NN4	Combustible Liquid Biodiesel	C1/C2	7m Diam. x 12m high	500 m^3
Additive Tank	Non-DG	-	2.67m Diam. x 9m high	50 m^3

Each tank will be fitted with the following:

- Auto-level gauging;
- High/Low level alarms;
- Multi-level temperature measurement;
- Multi-level sampling equipment;
- Water draining; and
- Low-level product drains for maintenance purposes

As noted previously, the tanks will be filled from the marine unloading facility, at the NPC wharf to the east of the terminal. The liquids will be transferred using the ships pump and via a gantry mounted pipeline from the wharf to the terminal. The liquids will be delivered by the pipeline to a manifold at the terminal from which the fuels can be directed by dedicated pipelines to the specific tanks as required.

Bio-diesel may be delivered to the terminal by road tanker and unloaded at the road tanker loading bay. Road tankers will enter the loading bay and connect to the bio-diesel transfer pipework. A dedicated terminal pump will then transfer the bio-diesel from the tanker to the dedicated bio-diesel storage tank.

The transfer operations and tank filling will be controlled from a central control room at the terminal. The control room will contain a computer control system that will monitor the tank levels and pipeline flows. Mimic screens will be installed in the control room to assist operators to monitor the terminal operations.

The tank bunds will be fitted with drains that will be piped to the stormwater collection system. Each drain will be fitted with a valve so that the bund drain can be isolated in the event of a product spill into the bund.

Rainwater events will obviously cause bund filling. However, once the rain event has finished, water in the bund will be inspected for contaminants and where no contamination has occurred, bund contents will be released to the bund retention pit, then through an API separator to the river.

3.2.4 Tanker Filling Facilities – Tanker Loading Bays & Gantries

Diesel fuel will be delivered to customers by road tanker. The road tankers will be loaded at a dedicated road tanker loading facility consisting of three dedicated loading bays and a steel gantry installation with steel colourbond cladding. Figure 3 shows the layout of the site and the location of the tanker loading bays.

Road tankers will enter the site via a driveway from the service road that will be constructed to allow vehicles to access the site. The service road will join the existing roads that access the general site area from Industrial Drive, and the main site access/egress driveways. The tankers will then enter a loading bay under the direction of a terminal operator. Once aligned in the bay, the tanker brakes will be applied and the appropriate driveaway protection initiated (i.e. brake-lock bars on the load points). This will prevent the drivers from leaving the site whilst still connected to the loading pipework. Once in the loading bay, the earthing connections will be made to prevent the build up of static during the transfer. The gantry will be fed from the product tanks via dedicated pumps and lines. Each gantry bay will be fitted with one diesel, one unleaded petrol, and one premium unleaded petrol bottom loading arm. Each arm will support bio-fuel blending facilities.

The tanker loading operation will be controlled by the vehicle driver using swipe card gantry access. The vehicles will be fitted with overfill and static protection. A dead-man button requiring regular activation by the vehicle driver will be integrated into the gantry emergency shutdown system. Various component interlocks will ensure safe operation during all phases of the truck loading. Once tanker filling is complete, the vehicles will leave via the northern driveway.

3.2.5 Ancillary Facilities

In addition to the storage and handling equipment at the terminal, a number of additional facilities will be constructed including:

- **Office & Amenities** – an office and amenities building will be constructed adjacent to the southern entry driveway. The building will be 7m long by 4m wide by 5m high and will be constructed from steel frame with colourbond cladding and roof.
- **Workshop** – a workshop will be constructed adjacent to the office/amenities building (southern side). The workshop will be 7m long by 4m wide by 5m high and will be constructed from a steel frame and colourbond cladding and roof.
- **Fire Pump House and Water Storage** – a fire pump house will be constructed on site adjacent to the northern exit driveway. The pump house will be 10m long by 5m wide by 5m high and will be constructed from a steel frame and colourbond cladding and roof. The pump house will contain two diesel driven fire pumps drawing fire water from two dedicated onsite fire water tanks. The fire water tank and pump capacities will be determined by a fire safety study conducted for the site.

3.3 Summary of Terminal Safety Features

A number of safety features are installed at the various terminal facilities. These are summarised in the following sub-sections.

3.3.1 Liquids Unloading Berth – NPC Wharf

The liquids unloading berth at the NPC wharf will be fitted with a number of safety features including:

- Fire monitor, with foam generating facilities, located at a safe operating distance from the unloading operations;
- Emergency automatic/remote isolating valves on the ship and shore pipework (i.e. at the flexible hose connection points);
- Emergency shut-down buttons located at the ship and wharf (to activate the remote/automatic isolation valves);
- Flexible transfer hoses operated and inspected/tested in accordance with the Australian Dangerous Goods code or ADG (Ref.2); and
- Bunded wharf to contain any spills, including a spill collection tank under the wharf to ensure no spill to the Hunter River.

Notwithstanding the above safeguards, in the event of an incident requiring the application of fire water, there is a potential for the capacity of the spill containment to be exceeded, resulting in spill of contaminated fire water to the Hunter River. As this study is a preliminary analysis and full details of the spill retention systems at the wharves are not complete, it is recommended that retention of contaminated fire water be reviewed and assessed during the fire safety study for the proposed terminal project.

3.3.2 Transfer Pipeline

The transfer pipeline design, construction and operations will incorporate a number of safety features including:

- Fully welded pipeline including non-destructive testing (e.g. x-ray and magnetic particle testing of welds);
- Full pressure test of the line on completion of construction;
- Installation of the pipeline on a gantry to prevent potential external impacts;
- Pressure testing with nitrogen prior and after connection by hose to the ship before the transfer operation commences;
- Line “pigging” after each transfer operation to ensure no dangerous goods are in the line when not in use;
- Annual hydrostatic testing of the transfer line from the wharf to the terminal; and
- Intelligent “pigging” of the line on a regular basis to determine pipeline integrity.

3.3.3 Storage Tanks

The storage tanks will be designed to API650 and operated in accordance with the requirements of AS1940-2004, “The storage and handling of flammable and combustible liquids” (Ref.3). As part of this, the following safety features will be installed:

- Tank level instruments (high and low) with independent high/high alarms;
- Tank vents with anti-flash gauze to prevent potential for sparking and ignition from external sources;
- Multi level temperature measurements; and
- Water draining facilities to prevent water build up in the tank and potential corrosion in the tank base.

It is noted that the operating temperature of the diesel tanks is well below the flash point of these liquids; hence, floating pans will not be necessary in these tanks.

3.3.4 Loading Bays/Gantries

The loading bays and gantries will be fitted with the following safety systems:

- Bottom loading arms, eliminating the need for flexible hoses;
- Electronic card access by drivers, eliminating unauthorised access to the gantry/loading facilities;
- Overfill protection for the tankers and static connections to prevent the potential for electrostatic build-up and spark/ignition source;
- A dead-man button requiring regular activation by the vehicle driver, integrated into the gantry emergency shutdown system;
- Automatic/remote isolation valves at the loading arm feed point to provide loading emergency shut down in the event of incident at the gantry/loading bay;
- Fixed automatic foam deluge system installed throughout the gantry area activated by Ultra Violet/Infra Red fire detection; and

3.3.5 Fire Safety Systems

The following fire safety systems and services will be provided for the proposed facility:

- Fire water pumps in accordance with the requirements of AS2419 (Ref.4) and NFPA20 (Ref.5);
- Fire water tank to provide a minimum of 90 minutes fire water on site (exact storage capacity of tanks to be determined by Fire Safety Study in accordance with the requirements of AS1940 – Ref.3);

- Fire ring main, with hydrants, monitors and foam generating facilities at selected locations around the terminal site;
- An access fire road around the bund to provide fire tender access as required;
- Hose reels and fire extinguishers located throughout the facility (installed in accordance with the applicable Australian Standards); and
- Fire protection facilities at the loading gantries (see **Section 3.3.4**).

The site will be staffed at all times during tank loading (from the liquid berths at the NPC wharf) and road tanker transfers.

4.0 Hazard Analysis and Risk Assessment

4.1 Types and Quantities of Dangerous Goods Stored at the Site

Figure 3 shows the site layout and Table 1 lists the various storage tanks and the quantities of diesel stored in each tank. The properties of diesel fuel (including bio-diesel) are provided in Table 2.

Table 2 Properties of the Dangerous Goods Proposed for Storage at the Marstel Bulk Liquids Terminal, Mayfield North, NSW

Material Name	Class/PG	Hazardous Properties
Combustible Liquid – Diesel	C1	Combustible liquids with a flash point greater than 60.5^{o}C but less than 150^{o}C are classified as C1. Diesel fuel has a flash point of around 90-100^{o}C, hence, is classified as a combustible liquid. Under these circumstances, the liquid does not flash (vaporise) readily at ambient temperature, hence, vapour clouds do not form and flash fires/vapour cloud explosions, at ambient temperature do not occur. Localised heating and minor vapour generation may result in ignition and pool fire which may escalate to larger incidents
Bio-Diesel	C1/C2	Biodiesel (chemical name – Fatty Acid Esters) may have a range of flash points above and below 150^{o}C. Hence, a specific biodiesel may be classified as C1 or C2. Hence, like diesel, the fuel does not flash (vaporise) readily at ambient temperature and the characteristics are similar to those of diesel.

A detailed Hazard Identification Table has been developed for the proposed terminal (see Table 3). This table identified a number of hazards, hazard causes, hazard consequences and safeguards installed at the site. A summary of each hazard and a qualitative assessment of the risk have been provided in the following sections.

4.2 Bulk Diesel Delivery – NPC Wharf (Mayfield 3.5)

Bulk fuel will be delivered to the terminal by ship. Ships will berth at the NPC wharf, located on the southern bank of the Hunter River, about 1km to the east of the proposed terminal. The ships will be berthed by a Newcastle Harbourmaster with the assistance of tugs. Once berthed, the ships will be tied to the wharf using double ropes (i.e. two ropes at every tie point). On completion of securing the ship the fuel transfer operations can commence. However, to minimise the potential for impact of spills to the river, an emergency boom containment system will be available at the wharf and ready for installation should a spill occur. A spill response procedure will be developed for boom deployment and training and boom deployment exercises will be conducted annually.

Prior to the commencement of fuel transfer it will be necessary to complete all of the requirements of the International Safety Guide for Oil Tankers and Terminals (ISGOTT). This guide requires a detailed checklist completion under the direction of the Maritime Services before any transfers can be commenced. The standard also requires complete monitoring of the transfer by ships staff and land based (terminal) personnel. Ships staff must monitor pump flows and have a crew member located at the transfer point at all times. Terminal staff must be present at the wharf and monitor tank loading at all times.

Once the approval for transfer has been given by the Maritime Services, the flexible hoses can be connected to the ship and wharf and the system configured for fuel transfer. On completion of equipment configuration, inspection and nitrogen pressure test, the transfer operation can commence. The ship's officer in charge of the transfer will start the ship's pumps and continually monitor the transfer operation. On completion, the ship's officer will shut-down the pumps and the fuel will be drained from the lines into the transfer pipeline. The flexible lines will then be disconnected and the ISGOTT procedures completed prior to the ship leaving the wharf.

A number of hazardous incidents may occur during this operation, mainly as a result of leaks from the flexible lines. Whilst the fuel is contained in the pipework and flexible lines, there is a minimal risk of incident, as air is not present in the line during the transfer operation. As the line will be purged with nitrogen prior to discharge, as

there are no ignition sources in the line and as the lines are earthed to prevent static build up, the potential for this incident has been effectively controlled.

Once the pipelines are full and fuel is being transferred, the flexible lines may leak or rupture due to overpressure or wear (from continual handling). Overpressure protection is provided in flexible line design. The flexible lines will be designed to withhold the full “dead-head” pressure pumps on all ships that will deliver fuel to the terminal. Hence, the overpressure potential has been designed “out-of” the system. However, continual handling of the lines may cause abrasive wear on the line exterior resulting in weak points and the potential for release of fuel to the wharf area. Minor nitrogen leaks would be immediately detected by the wharf/terminal staff and transfer not commenced until line repairs were affected. In the event of an ignition of a minor leak, the fire would be contained in the immediate area of the release and local fire fighting equipment (extinguishers) would be available to commence fire fighting in the area. As the transfer of fuel at the wharf is conducted near the Hunter River, it would be advisable to avoid using any water for minor fires. Hence, first attack fire fighting by ship’s staff and terminal operators would be conducted using fire extinguishers. As the fire is fuelled by a combustible liquid, the capacity of a normal hand held fire extinguisher (dry powder – 9kg) may not be sufficient to control the fire. Hence, it is recommended that Marstel install a 50kg wheeled dry powder extinguisher at the NPC Wharf. This will provide sufficient fire fighting capacity for any small fires that may occur at the wharf. As minor fires will be controlled by ship’s and terminal staff, and within the confines of the wharf (i.e. no offsite impact), the risks associated with wharf incidents are considered to be low and within the as low as reasonably practicable (ALARP) range.

In the unlikely event of a flexible hose split (i.e. catastrophic failure), the hose contents would be released to the wharf. Staff on the ship and at the wharf/terminal would immediately identify the split/release and initiate shut down of the delivery by activating the emergency shut-down valves at the ships manifold and wharf connection. However, this would not prevent the contents of the hose spilling to the wharf resulting in a pool of combustible liquid. As the wharf is located adjacent to the Hunter River, it is possible for the fuel to spill to the river itself, resulting in potential environmental damage. However, the wharf is bunded with a raised concrete edge around the whole wharf. This, in effect, provides a containment bund for any spills. The wharf will be fitted with a drainage system that will direct any spills to a storage tank and oil separator. Any spills will be collected and treated to ensure no oil release occurs to the environment. However, it is noted that in the event of a spill of oil and ignition, a fire may occur, requiring the application of fire fighting foam. This could result in emulsification of the oil with the fire water, defeating the effectiveness of the oil separator. Hence, it will be necessary to ensure the spill retention tank is capable of retaining sufficient contaminated fire water (i.e. oil/water mix) without release to the environment. It is therefore recommended that a fire safety study be conducted for the terminal, including potential fire impacts at the NPC diesel fuel delivery wharf.

Further, as part of the ISGOTT requirements, a containment boom would be installed around the ship and wharf. Hence, in the unlikely event any fuel reaches the river, it will be contained in the immediate area of the wharf. Notwithstanding this, it is recommended that a separate wharf emergency plan be developed including spills, potential environmental impact and fires. The plan should be held in a waterproof container at the wharf and be available as part of the wharf operations. The plan should also contain spill response procedures and fire fighting response. Emergency drills/exercises should also be included as part of the plan to be conducted at regular intervals as part of safety preparedness. As the wharf is bunded and spill booms are available, this incident considered to be low risk and, based on the safety features at the wharf, maintained within the ALARP range.

In the event of a flexible line rupture, and fuel spill, a pool of combustible liquid will form in the area around the leak point. Ignition of diesel fuel in this incident is highly unlikely, as the fuel does not readily “flash” into vapour. In the highly unlikely event an ignition of the release occurs, a pool fire would result within the bunded area on the wharf. Pool fires have the potential to radiate heat to the surrounding area resulting in impact to offsite structures and personnel. It is noted that the wharf is staffed during all transfer operations by ship and terminal operators, hence, these personnel can initiate immediate fire fighting and implementation of the site emergency plan, including calling the Combat Agency (Fire Brigade) for assistance. Based on the fire fighting provisions at the wharf and the attendance of operators during all transfer operations, the risks for continued fire are considered low and within the ALARP range.

4.3 Bulk Fuel Transfer – NPC Wharf (Mayfield 3.5) to Terminal

The fuel will be delivered from the wharf to the terminal by an above ground 400mm pipeline located in under the existing piperack. The pipeline will follow a direct route (parallel to the bank of the Hunter River) from the wharf to the terminal, entering the terminal from the northern side.

The single 400mm pipeline will be installed for the transfer of diesel fuel. The pipeline will be constructed from steel and will be fully welded along its full length. NDT of welds will be conducted on completion of construction to confirm weld integrity. The pipeline will also be “pigged” on completion of every transfer of diesel to extract all fuel from the line so that any pipeline breaches (e.g. external interference) will not result in environmental release. During transfer, fuel flow rates (from the ship and into the terminal) and fuel delivery reconciliation will be performed to identify potential leaks. Any discrepancies during transfer will initiate an immediate shut down and investigation.

The potential for pipeline leaks are significantly reduced by the location of the pipelines in an existing piperack corridor, allowing inspection for damage or other impacts that may cause loss of pipeline integrity. The location of the pipeline in a piperack corridor will also reduce the potential for impact from vehicles, as the rack will be readily identified by any vehicles in the area. It is noted that the piperack is currently located on land owned by NPC and access to this area will be controlled by a security gate managed by NPC to ensure no unauthorised vehicles enter the pipeline easement.

The highest risk to the pipeline is impact from vehicles that may cause damage to the piperack supports and subsequent damage to the pipeline. However, a review of the piperack construction indicates that the rack columns and supports are constructed from 400mm square section steel and 400mm “I” Beams. In addition, higher risk locations will be protected by “Armco” barriers. This construction provides considerable strength and impact resistance and vehicles moving in the vicinity of the piperack would not cause significant damage in the event of impact. The potential for pipeline breach as a result of damage from vehicles striking the piperack is low due to the specific piperack construction.

As noted above, the risk of internal corrosion of the pipeline is low as the pipeline will not rest with liquids inside the pipeline. However, as an added precaution, Marstel will “Pig” the line at regular intervals (i.e. after every diesel delivery) and conduct an annual hydrostatic pressure test of the pipeline. Hence, the risk of leaks from corrosion in the pipeline is low.

The design, construction, installation and management systems for the control of the pipeline have reduced the risks to a very low level, considering the pipeline will not carry diesel fuel for the vast majority of its life (i.e. pigged and purged after every use), and the regular testing of the pipeline (including annual hydrostatic pressure test). Incidents involving the pipeline are considered to be low risk and within the ALARP range.

4.4 Terminal Storage Tanks and Associated Equipment

The proposed terminal layout is shown in Figure 3. The terminal will consist of a main bund with three large tanks (with volumes >10,000m^3) segregated by 600mm high intermediate bunds. Two smaller tanks 500m^3 and 50m^3) are located in the bund with Tank NN1

Whilst contained within the tanks, the diesel fuel is low risk. However, the space above the fuel surface in the tank (“air” gap or ullage space) may contain vapours that evaporate from the surface of the stored liquid. Normally, the concentration of vapours is well above the upper flammable limit of the vapours; hence, there is no potential for explosion and fire. However, when tanks are emptied there is a potential to draw air into the ullage space creating a flammable/combustible mixture (i.e. within the flammable range of the vapours when mixed with air). It is noted that diesel is a Class C1 combustible liquid with a flash point well above ambient operating temperature (i.e. >90^oC), hence, there will be no vapour generation within the tank and therefore no propensity for explosion in the tank vapour space. To ensure tank temperatures do not rise above flash point, temperature instruments will be installed within the tank and alarmed to identify temperature rise. Based on the fact that the fuel stored is a Class C1 and that temperatures within the tank are monitored, the risk of explosion in a diesel tank is low, if not negligible, and certainly within the ALARP range at this site.

In the unlikely event of a tank leak (i.e. from the tank shell or fitting attached to the tank), there is a potential for the diesel to spill into the bund. Tank failure could lead to loss of containment of the tank and the full tank contents spilling into the bund. The bund would contain the spill and there would be no release to the environment. Reiterating the above details, the fuel spilled is diesel, with a flash point >90^oC. Hence, there would be no vapour generated during the release and the risk of ignition and fire is very low.

Based on the tank design, spill containment (bunds) and material properties, the risks associated with tank incident are considered to be low and within the ALARP range.

4.5 Tanker Loading, Transfer Pumps and Associated Pipework

Diesel fuel will be transferred from the tanks to the tanker loading bays/gantries using fuel transfer pumps. The pumps will be located in a pump gallery that will be located on the western side of the bunded area. Figure 3 shows the location of the pump gallery at the site.

Fuel transfer to the road tankers will be controlled by computer. The filling commencement will be initiated by the road tanker driver using a swipe card. Once initiated, the tanker transfer will commence and the specific pump will transfer the fuel to the selected bay/loading arm.

The pumps installed at the terminal will all be fitted with mechanical seals to minimise the potential for leaks at the pump seal housing. In the unlikely event of a pump leak, the fuel would spill to the ground under the pump and be contained in the pump gallery bund. Hence, there would be no release offsite. Pipework leaks from the pipelines between the tanks and the pumps would all be contained within the main tank bunding at the terminal. Hence, there would be no environmental impact from leaks in these areas. Leaks would accumulate within the sumps in these areas, triggering a high level sump switch and alarm.

An ignition of a transfer pump leak may occur due to a faulty seal and overheating of the seal leading to ignition of the fuel. This would lead to a bund fire in the pump gallery bund. This may radiate heat into the area to the west with the potential to impact offsite. However, the pump bunds will be protected by a foam deluge system, which is extended from the fuel loading gantry foam protection system. Hence, any fires in this area would be of short duration and offsite impact (if any) would be minimal.

In summary, the safeguards installed at the pump gallery are considered to ensure the risks associated with operations in this area are low and within the ALARP range.

4.6 Loading Bays and Gantries – Fuel Tanker Loading

Tanker drivers will access the truck loading bays from the south western entry driveway. Trucks will enter the designated loading bay and stop adjacent to the specified loading arm. Trucks will be loaded by bottom filling only (i.e. loading arms will be connected to filling points at the bottom of the tanker). The tanker driver will then connect the earthing strap to prevent static electricity generation during the transfer. In order to connect the loading arm, the tanker driver will activate the “driveaway protection bar” that is fitted across the fill points. Pushing down the bar, in order to connect the loading arm, will activate the tanker brakes, preventing driveaway by error. Once the loading arm is connected to the tanker, the driver will swipe a card at the computer interface and the computer will automatically configure the valves accordingly. In the event the driver incorrectly selects a loading arm (i.e. connects the wrong arm to the tanker), the computer will identify this error and alarm the driver and terminal operator that an incorrect connection has been made. Once the correct arm is selected and the appropriate connections made, the transfer can commence. Filling is continually monitored by the computer control and by the operator, who remains with the vehicle during the full filling cycle. Once complete (i.e. tanker full), the computer ceases the filling cycle, stops the pump and shuts all isolation valves. The driver can then disconnect the tanker and leave the site, noting that the driver cannot leave until the loading arm is disconnected and the “driveaway protection bar” is raised.

Minor spill may occur as a result of connection/disconnection of the loading arm. However, to prevent this dry break couplings are used on all tankers, eliminating the potential for spills from this source. Loading arm leaks may occur at joints and flanges, resulting in minor spills to the ground around the tanker. Premature disconnection of the loading arm could occur due to driver/operator error, resulting in spills around the fill point area. These leaks and spills could have the potential to reach the environment (i.e. the adjacent sites of access road). However, to prevent this, the loading bays are fitted with a “speed-hump” style bunded area, where spills will be contained. In the unlikely event a spill escapes beyond the loading bay bunded area, the drains adjacent to the bay all report to the stormwater retention pit adjacent to the pump gallery (north side). Hence, leaks and spills will not escape offsite and will be contained, preventing any environmental impact.

In the event of a coupling release (by fault or error) or a leak at joints/flanges/valves, the combustible liquid will form a pool under the leak/spill point. In the event of ignition, a pool fire will result. To minimise the potential for ignition, the terminal will control all ignition sources in the loading bay/gantry area. Smoking will not be permitted on site, including the areas to the south west (external areas of offices, workshop, etc.). No work will be permitted in the loading bay/gantry area unless a work permit has been issued, and all equipment in the loading bay/gantry area will be installed in accordance with the appropriate hazardous area classification. Ignition will be unlikely in this area, however, notwithstanding the ignition control, there is still a potential for leak and fire in this area, with

impact to the north and west of the site (adjacent site and access road). To minimise the fire duration, the gantry area is fitted with UV/IR fire detectors and a foam deluge system that will mitigate the potential impacts. Hence, as fire duration is short, offsite impact would be negligible.

In summary, the risks associated with the truck loading operations at the gantry are considered to be low and within the ALARP range.

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5.0 Conclusions and Recommendations

5.1 Conclusions

The Hazard Analysis and Risk Assessment conducted in this section of the document has been prepared using a qualitative analysis due to the nature of the materials stored and handled at the terminal and the nature of the surrounding land uses (industrial). As the closest residential area to the proposed site is over 900m away, it is concluded that a qualitative methodology is suitable for the proposed terminal facility.

The study assessed the Hazards and Risks associated with the operations at the terminal. It was identified that only diesel products will be stored and handled at the site and that diesel is a low risk material due to its high flash point (i.e. >90^{o}C). It was concluded that diesel storage and handling results in a very low risk of ignition and fire/explosion.

Overall, based on the assessment of the handling operations, the nature of diesel fuel and the safeguards installed at the site, it was concluded that the risks at the proposed Marstel Terminal would be low and within the ALARP range.

5.2 Recommendations

Notwithstanding the above conclusions, a number of recommendations are made. The recommendations have been made to enhance the existing safety features at the site:

1. It was identified that in the event of fire at the fuel unloading berth (NPC - Mayfield 3.5), it may be necessary to apply fire water to the fire, resulting in water contamination that could be carried into the Hunter River, causing pollution damage. At this stage of the site development, a detailed Berth spill retention system has not been completed and therefore it is recommended that retention of contaminated fire water be reviewed and assessed using a fire safety study approach for the proposed terminal project.

2. In addition to the recommendation made in 1 above, to minimise the requirement for fire water use, dry chemical powder could be used for smaller fires in the area. Hence, it is recommended that Marstel install a 50kg wheeled dry powder extinguisher at the NPC Wharf.

3. It is noted that foam fire fighting systems are installed in some areas at the site. Foam fire fighting medium is an emulsifying agent, which could emulsify the diesel fuel with the fire water. This could result in failure of the oil separator units at the site stormwater discharge, preventing separation of the diesel from the water. The resultant emulsified liquid may be released to the environment causing impact and damage. It is therefore recommended that a fire safety study be conducted for the terminal, including potential fire impacts at the NPC diesel fuel delivery wharf.

4. Under the provisions of Section 6A of the NSW Occupational health and Safety (Dangerous Goods Amendment) Regulation 2005, it will be necessary to prepare an Emergency Response Plan for the proposed Terminal. Emergencies at the wharf are different to this that would be encountered at the Terminal site. Development of an all encompassing plan may result in a reasonably large document that could be unwieldy (i.e. difficult to find details in an emergency situation). It is therefore recommended that a separate Wharf/Berth emergency plan be developed including spills, potential environmental impact and fires. The plan should be held in a waterproof container at the wharf and be available as part of the wharf operations. The plan should also contain spill response procedures and fire fighting response. Emergency drills/exercises should also be included as part of the plan to be conducted at regular intervals as part of safety preparedness.

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Table 3 Hazard Identification Table

Site Area	Cause	Consequence	Safeguard
Liquids Transfer Berth (Koppers Wharf)	- Ships enters berth at too high speed	- Potential for ship to strike the wharf resulting in damage to ship's hull, hull breach and release of combustible liquid to Hunter River	- Ship is berthed with assistance from Newcastle Ports Pilot (trained in Newcastle berth procedures) - Ships speed is limited during approach to berth (monitored by Pilot) - Berthing assistance is provided by Newcastle Harbour Tugs (prevent direct approach to wharf by ship) - Berthing facilities and operations follow strict ISGOTT procedures - Ship's captain is certified master mariner, with extensive ship handling experience Wharf is fitted with "Fenders" to prevent direct strike of solid wharf components on the ship
Liquid (Fuel) Delivery and transfer using flexible hose (including bulk fuel deliveries at wharf)	- Hose failure - Connection failure - Human error (incorrect connection) - Ship moves away from berth (wind, failed lines)	- Potential spill on the ship's deck - Spill onto the Mayfield 3.5 wharf or Koppers wharf - Potential spill off ship's deck or wharf into the harbour (Hunter River) – environmental impact - Ignition of spill and fire on the wharf and in the contained boom area around the ship	- Personnel (Ship and Shore) in attendance during full fuel delivery/transfer - Wharf area where fuel lines are located is bunded to prevent direct spill to the Hunter River - A spill containment boom will be established around the ship and wharf for all delivery/transfer operations - Site emergency plan will be developed to respond to spills - Spill kit will be available for minor spills - Monitor, with foam generation facilities, will be installed adjacent to the fuel transfer point at a safe distance from the flexible lines (to be established by Fire Safety Study) - Additional fire hydrants located close (within 60m) of the fuel transfer location - Emergency shut off valves installed on pipework, operated automatically or by remote actuation "button" on the ship and shore - Ship is tied up with two lines at every tie point
Liquid transfer via pipeline (diesel fuel)	- Pipeline leak due to corrosion, overpressure, poor	- Leak of liquid to environment - Ignition of leak and fire at leak point	- Pipeline will be fully welded steel along the full length (no flanges creating leak sources) - Pipeline welding will be fully non-destructive tested (e.g. x-ray and magnetic particle) - Pipeline will be designed to withstand full pump "dead-head" with a conservative factor of safety (i.e. no rupture) - Pipeline will be "pigged" after each delivery to extract all fuel from the line so that no fuel

Site Area	Cause	Consequence	Safeguard
	construction (welding), external interference		will be present when the line is not in use (i.e. diesel) - Pipeline will be installed under a gantry along its full length to minimise the potential for impact from external sources - Pipeline will be hydraulically tested to a pressure in excess of operating pressure on completion of construction - Pipeline transfer will be fully monitored by instruments both on ship and shore facilities (i.e. pressure, flow, etc.) - The pipeline will be inspected and tested with an "intelligent" pig on a regular basis (time frame to be determined) to identify potential faults - Pipeline will be painted to protected against external corrosion - Nitrogen will be used to purge the line after each transfer
Fuel storage	- Overfill of tank during tank filling - Spill of fuel into the bund - Ignition and bund fire	- Potential offsite release, environmental impact - Potential offsite heat radiation impact to surrounding areas	- Fuel storage is bunded, no offsite release - Tanks are monitored during filling using level instrumentation (level in tanks repeated in the site office) - All tank are fitted with high level instruments and alarms (audible and visual in the site office) - Visual inspection and checking of tank/bund area is performed during the transfer/filling operation - Tank fill volume is passed to ship for monitoring, ship constantly monitors the transferred volume and notifies shore when volume limit is approaching - Fire main (complying with AS2419-Ref.4), fire pumps (complying with NFPA20 – Ref.5) and fire water tank - Fire hydrants and hose reels close to the storage - Fire monitors with foam generation installed adjacent to the bund (but at safe distance) - Fire contained to bund – bund capacity exceeds largest tank in bund (plus sprinkler allowance) - For the diesel storages, diesel is difficult to ignite (low ignition probability) - All tanks will be regularly inspected for potential leaks and corrosion impact, water build up in the tanks will be drained regularly to prevent internal corrosion potential. - Tank level monitoring will be conducted at all times to identify potential rapid tank level loss indicating potential leaks
Fuel Storage	- Ignition of fuel	- Tank explosion and tank	- All tanks will be fully vented with anti-flash gauze on vents to prevent ignition from entering

Site Area	Cause	Consequence	Safeguard
	in the tank	roof fire - Explosion overpressure and/or Heat radiation impact to surrounding area	the tank via the vent - All electrical equipment in the tank will be suitably specified for the specific hazardous area in which it will be installed (i.e. flameproof equipment installed on tanks and in the bund) - Tank temperature monitoring will be installed in all tanks to ensure liquids do not vaporise and generate combustible mixtures in tanks
Combustible Liquid Transfer Pumps (Tank Farm)	- Pipework, valve or flange leak - Pump seal leak - Ignition and fire in bunded area, at pumps	- Release of fuel to bunded area - Potential for ignition of fuel leak and fire	- Pump seals are double mechanical type to minimise the potential for leak - Pump area is bunded to contain spills - Fire main (complying with AS2419-Ref.4), fire pumps (complying with NFPA20 – Ref.5) and fire water tank - Fire hydrants and hose reels close to the pumps and pipework - Control of ignition sources in the pump bund area (bund will be classified as a hazardous area in accordance with Australian Standards – e.g. AS60079.10 (Ref.6) - Ignition sources controlled on site (no smoking, hot work controlled by Permit, vehicle access monitored and controlled)
Tanker loading pipework and pumps	- Pipework, valve or flange leak - Pump seal leak - Ignition and fire in bunded area, at pumps or in area between pumps and gantry	- Release of fuel to bunded area or in area between pumps and gantry - Potential to impact environment if release escapes offsite - Potential for ignition of fuel leak and fire	- Pipework between tanks and pumps is bunded and leaks will be contained within the tanks bunded area - Pump seals are double mechanical type to minimise the potential for leak - Pump area is bunded to contain spills - Pipework between pumps and gantry is located in a spill containment to prevent spills offsite - Pump operation is only conducted when site is staffed and pump/filling operations can be continually monitored - Fire main (complying with AS2419-Ref.4), fire pumps (complying with NFPA20 – Ref.5) and fire water tank - Fire hydrants and hose reels close to the pumps and pipework - Fire monitors with foam generation installed adjacent to the pump bund (but at safe distance) - Control of ignition sources in the pump bund area (bund will be classified as a hazardous area in accordance with Australian Standards – e.g. AS60079.10 (Ref.6) - Ignition sources controlled on site (no smoking, hot work controlled by Permit, vehicle access monitored and controlled)

Site Area	Cause	Consequence	Safeguard
Fuel Tanker loading bays and gantry	- Tanker impacts gantry - Tanker impacts gantry - Tanker driveaway whilst connected - Gantry loading arm failure (leak/rupture) - Operator error – incorrect connection of loading arm - Fuel leak, ignition and fire	- Release of fuel into the loading bay - Potential spill and impact to the environment - Heat radiation impact - Potential spill and impact to the environment	- Gantry/loading bay area is bunded to contain spills - Tanker loading operation is monitored by tanker drivers and terminal operators during the full transfer operations - Gantry area is under closed circuit television (CCTV) surveillance at all times, with screens in the main site office - Trucks are fitted with driveaway protection to prevent drivers leaving the site whilst the truck is connected to the gantry (via the loading arm) - Loading arms are fully tested at installation and maintained continually throughout the plant's life - Bollard and "Armco" protection at the entry to the gantry/bay area - Dry break coupling installed on loading arm for connection to the tanker loading point - UV/IR fire detection installed in the gantry area - Foam sprinkler/deluge system installed over the gantry area - Fire main, hydrants and hose reels installed in the gantry area - Monitors with foam generation equipment installed adjacent to the gantry area - Control of ignition sources in the gantry area (gantry area will be classified as a hazardous area in accordance with Australian Standards – e.g. AS60079.10 (Ref.6) - Computer controlled filling system operated by the tanker driver using a "swipe-card" - Operator and driver in full attendance during all transfer operations – alarm can be immediately raised in the event of spill and fire - Emergency button shut down (stops pump and isolates delivery valves) located in the gantry bays

6.0 References

1) DP&I (1994), “Applying SEPP 33”, Hazardous and Offensive Industry Development Application Guidelines.

2) The Australian Code for the Transport of Dangerous Goods by Road and Rail (known as the Australian Dangerous Goods Code or ADG), 6th ed., Federal Office of Road Safety, Canberra, ACT (1998).

3) AS1940-2004,”The storage and handling of flammable and combustible liquids”, Standards Association of Australia, Sydney.

4) AS2419.1-2005, “Fire Hydrant Installations Part 1: System Design, Installation and Commissioning”, Standards Association of Australia, Sydney.

5) NFPA20-1999, “Installation of Stationary Pumps for Fire Protection”, National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, Massachusetts 02269-9101, USA.

6) AS60079.10-2004, “Electrical Apparatus for Explosive Gas Atmospheres – Classification of Hazardous Areas”, Standards Association of Australia, Sydney.

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Appendix F

Air Quality Impact Assessment

Appendix F Air Quality Impact Assessment

Proposed Bulk Liquid Fuel Storage Facility

Marstel Terminals Newcastle Pty Limited

11 August 2011

Air Quality Impact Assessment

Proposed Bulk Liquid Fuel Storage Facility



Air Quality Impact Assessment

Proposed Bulk Liquid Fuel Storage Facility

Prepared for

Marstel Terminals Newcastle Pty Limited

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Document Air Quality Impact Assessment

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Table of Contents

1.0 Introduction 1
1.1 Scope of Work 1
2.0 Description of Site and Operations 2
2.1 Site Description 2
2.2 Operations 2
2.3 Construction Details 3
2.4 Emissions 3
2.4.1 Volatile Organic Compounds 3
2.4.2 Odour 3
2.4.3 Dust 3
3.0 Existing Environment 5
3.1 Air Quality 5
3.2 Regional Meteorology 5
3.2.1 Climate 5
3.2.2 Wind Direction 5
4.0 Dispersion Modelling Methodology 6
4.1 Dispersion Model 6
4.2 Modelling Scenario 6
4.3 Assessment Criterion 6
4.4 Model Inputs 6
4.4.1 Meteorology 7
4.4.2 Terrain Effects 7
4.4.3 Building Wake Effects 7
4.4.4 Source Characteristics 8
4.4.5 Emissions Inventory 8
4.4.6 Sensitive Receptors 10
5.0 Modelling Results and Impact Assessment 11
6.0 Greenhouse Gas Assessment 12
6.1 Electricity Consumption 12
6.2 Fuel Consumption 13
6.2.1 Delivery and Dispatch of Fuel 13
6.2.2 Staff Movements 13
6.2.3 Consumption of Marstel Fuel by End Users 14
6.3 Emissions Summary 14
7.0 Conclusion 16

Appendix A
Climate and Meteorological Data A

Appendix B
AUSPLUME Modelling Files B

Appendix C
TANKS Output Files C

1.0 Introduction

AECOM Australia Pty Ltd (AECOM) was commissioned by Marstel Terminals Newcastle Pty Limited (Marstel) to assess the potential effects on air quality from the proposed bulk liquid fuel storage terminal to be located at Mayfield, NSW. The purpose of the assessment was to assess the air and greenhouse gas (GHG) emissions associated with the operation of the proposed facility.

The proposed project involves the construction of a terminal facility that will be used for the importation, storage and distribution of diesel and biodiesel fuels. A total annual throughput of diesel of 264 megalitres (ML) would be received via ship from around 15 vessels per year, with a maximum on-site diesel storage capacity of 54 ML at any one time. The diesel would be dispatched to customers via truck. A total throughput of approximately 36 ML of biodiesel would be both delivered and dispatched via truck, with an on-site storage capacity of 500 m^3.

The main potential sources of air emissions associated with the proposed development are vapour emissions from the storage and transfer of fuels (volatile organic compounds, or VOCs). Greenhouse gases (GHGs) would also be emitted by the proposed project. This report provides details of the methodology and results of the dispersion modelling of VOCs and an estimation of the potential GHG emissions.

1.1 Scope of Work

The Director-General's Requirements for the environmental assessment of the project were issued by the Department of Planning and Infrastructure on 7 July 2011. These required the assessment to include the following:

- *a quantitative assessment of the air quality and odour impacts of the project on surrounding receivers*; and
- *a quantitative assessment of the potential scope 1, 2 and 3 greenhouse gas emissions of the project and a qualitative assessment of the potential impacts of these emissions on the environment*.

The assessment of air emissions was limited to VOCs during operation of the proposed facility. As described in **Section 2.4**, due to the type of fuels proposed to be stored at the site and the distance between the site and sensitive receptors, odour was not expected to be an issue for the site. Furthermore, emissions associated with construction works for the project would be expected to be easily managed through standard construction practices. Benzene was chosen as an indicator species for VOCs, and was the only pollutant modelled. Benzene concentrations at sensitive receptor locations were estimated through dispersion modelling undertaken using the AUSPLUME program in accordance with the Office of Environment and Heritage (OEH) guidelines for air pollutant assessments[1]. GHG emissions associated with the proposed facility were estimated using the National Greenhouse Accounts (NGA) Factors (July 2011)[2].

[1] DEC. (2005). Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales.
[2] Department of Climate Change and Energy Efficiency. (2011). National Greenhouse Accounts Factors, July 2011. Commonwealth of Australia.

2.0 Description of Site and Operations

2.1 Site Description

The terminal would be located on part of the former BHP Steelworks site, known as the Mayfield Concept Approval Site, as shown in **Figure 1**. The site is approximately 5 km northwest of the Newcastle Central Business District. The land on which the facilities are to be located would be leased from Newcastle Port Corporation. The proposed terminal would be situated opposite Kooragang Island. The topography in the area beside the Hunter River is essentially flat. The area surrounding the proposed terminal is characterised by a mixture of port-related activities, industrial uses, and residential and commercial areas. The nearest residential area is located at Mayfield with the closest receptors approximately 900 m from the proposed terminal site. Neighbouring industry includes OneSteel and Koppers Coal Tar Products to the west and Port Waratah Coal Services to the north. Land to the east and south of the site is currently vacant and proposed for future industrial development.

2.2 Operations

Marstel proposes to construct and operate a bulk fuels terminal to receive, store and dispatch diesel and biodiesel fuel. The facility would have a total annual throughput of diesel of 264 megalitres (ML), received from around 15 shipping vessels per year, and would store a maximum of 54 ML of diesel at any one time. The diesel would be dispatched to customers via truck. A total throughput of approximately 36 ML of biodiesel would be both delivered and dispatched via truck, with an on-site storage capacity of 500 m^3. All fuels would be stored in above-ground tanks.

The facility would make use of an existing ship berthing facility to receive diesel fuel, which would be transferred to site using an above-ground, dedicated pipeline approximately 1 km in length. The pipeline would follow the route of an existing pipeline that transports materials to the neighbouring Koppers facility, and, if possible, would utilise the existing support structures.

There would be 18 trucks each business day dispatching diesel by road, and approximately 9 trucks per day on Saturdays, resulting in around 5,103 diesel dispatch trucks per year. Biodiesel would be delivered and dispatched by two trucks per business day, and one delivery and one dispatch of biodiesel per day would occur on Saturdays, equating to around 1,134 biodiesel trucks per year. Truck loading for dispatch would take approximately 45 minutes. Ship unloading would typically be undertaken over a 36 hour period, and would be undertaken as required.

The typical operating hours for the site would be 6 am – 4 pm Monday to Friday, and 6 am to 12 pm on Saturdays. Marstel is, however, seeking approval for 24 hour operations to enable dispatch and delivery to occur as required.

The dimensions of the proposed structures to be constructed on site are summarised in **Table 1**.

Table 1 Tank Farm Structures

Structure	Approximate Size	No
Diesel tanks	36 m diameter; 17 m high	3
Biodiesel tank	8 m diameter; 12 m high	1
Office and amenities	16 m x 9 m; 5 m high	1
Truck-loading gantry	25 m x 16.5 m; 8 m high	1
Workshop	11 m x 9 m; 5 m high	1
Fire water storage tanks	16 m diameter; 15 m high	1

2.3 Construction Details

The target completion date for the terminal is December 2012. The construction works are expected to take approximately 14 months, and would include the following:

- Excavation of areas for tank foundations (to a maximum of 0.6 m below the existing cap surface).
- Construction of tank foundations and reinforced concrete bund walls.
- Preparation of the bund floor (excavation, backfilling with crushed rock, installation of liner, additional backfilling with crushed rock and priming/sealing).
- Installation and diversion of services and infrastructure, including stormwater drainage lines.
- Relocation of the tanks to site and the fabrication of related piping and pump equipment.
- Construction of internal roadways (excavation, compacting of road base, pouring of concrete pavement (reinforced) for main driveway.
- Construction of a pipeline on existing supports to transfer materials between the berth and the storage facility.
- Construction vehicle movements.

Much of the material would be prefabricated wherever possible, particularly fuel facility components, thereby minimising the on-site construction activities.

2.4 Emissions

2.4.1 Volatile Organic Compounds

The main emissions of concern for fuel storage activities are volatile organic compounds (VOCs). VOCs are organic compounds with a vapour pressure exceeding 0.13 kPa at a temperature of 20 ^{o}C. VOCs have been implicated as a major precursor in the production of photochemical smog, which causes atmospheric haze, eye irritation and respiratory problems. VOCs can be emitted from storage tanks, filling stations vents, pipelines and process equipment leaks at plant associated with fuel storage.

The OEH does not have a criterion for collective VOCs, rather provides impact assessment criteria for a number of individual VOC species. No data regarding the speciation of VOCs in diesel and biodiesel fuels, however, were available at the time of this assessment. In order to assess the effects of VOC emissions from the proposed facility, benzene was chosen as an indicator pollutant of VOCs due to its toxicity and carcinogenicity. Details regarding the estimation of benzene in the fuels are provided in **Section 4.4.5**.

2.4.2 Odour

Odour emissions from fuels are typically associated with aromatic hydrocarbons, of which VOCs are a subclass. No data regarding actual odour emissions from such a facility were identified at the time of preparation of this report. The level of odour emission, however, is dependent upon the vapour pressure of the substances; compounds with higher vapour pressures emit higher levels of odour. As diesel and biodiesel fuel have low vapour pressures, odour emissions from the storage of these substances are expected to be minimal.

Furthermore, sensitive receptors would be located at a distance of 900 m or greater from the proposed facility. The minimum accepted buffer zone distance for sewerage treatment plants, a known odorous industry, is 400 m [3]. As the proposed facility is expected to have much lower odour emissions than an STP, and any emissions would be expected to be less offensive than emissions from an STP, a distance of 900 m to the closest receptor is expected to be sufficient to mitigate potential adverse odour impacts. As such, odour was not assessed further.

2.4.3 Dust

Dust emissions from the construction of the Marstel terminal may result from typical land preparation practices such as excavation of soil, movement of scrapers and graders and the formation of stockpiles. As these emissions will be short-term and episodic in nature, they will be managed through the implementation of standard dust management practices, such as wetting down roadways and stockpiles and minimising exposed areas. The control of dust emissions during construction will be managed by procedures outlined in a Construction

[3] Department of Urban Affairs and Planning, Circular No. E3, issued 17 March 1989.

Environmental Management Plan (CEMP) prepared for the facility. Dispersion modelling was not, therefore, warranted for this aspect of operations, and no further discussion of dust impacts is provided in this AQIA.

3.0 Existing Environment

3.1 Air Quality

Following the cessation of steel manufacturing in the area, Newcastle's air quality has improved in recent years. A number of pollutant sources remain, however, including industrial, domestic and transportation activities, with motor vehicles considered to provide the greatest challenge to local air quality. The primary pollutants of concern in the Newcastle airshed are particulate matter and photochemical smog/ozone and its precursors (oxides of nitrogen and VOCs)[4]. Industrial pollutant sources include the nearby Orica and Incitec plants, and the Tomago Aluminium smelter. Dust emissions arise from the coal and grain terminals, while odour emissions from seed processing (Cargill) and coal tar processing (Koppers) commonly affect the Mayfield and Kooragang Island areas. There are currently three fuel storage facilities in Newcastle: Caltex (Wickham), BP (Carrington) and Shell (Hamilton), which are located adjacent to or near to residential areas.

The pollutants of prime concern in NSW are ozone and particulates, with levels of these pollutants approaching or exceeding the national standards prescribed in the National Environment Protection Measure for Ambient Air Quality (NEPM) on occasion. Pollutant levels in Newcastle, however, are generally acceptable, with few exceedences noted[4]. The Marstel facility is not expected to generate significant levels of ozone or particulates and, as such, these pollutants are not considered further in this assessment.

The OEH measured ambient concentrations of benzene in the Newcastle region between 1996 and 2001 [5]. Average background benzene concentrations were approximately 0.8 ppb (2.6 µg/m^3), which is less than 10 % of the guideline level for this pollutant. As the concentration of benzene in fuel has been reduced by a factor of five since the completion of the EPA study, and no significant alternative sources of benzene have been added to the area, current background concentrations are expected to be less than those reported by the OEH. In order to provide a conservative assessment, however, the background concentration of benzene adopted for this study was 2.6 µg/m^3.

3.2 Regional Meteorology

The Bureau of Meteorology (BOM) records long-term meteorological data at a number of automatic weather stations around the country. The BOM station that best represents the region is located at Williamtown, approximately 13 km northeast of the proposed Site. Selected regional meteorological data were obtained from the BOM Williamtown monitoring station; a summary is provided in the following sections. Average climate parameters recorded at this station are shown in **Appendix A**.

3.2.1 Climate

The warmest temperatures occur between November and March, with the warmest average maximum temperatures occurring in January (28.0 ºC). The coldest temperatures are recorded in the winter months, with the lowest average minimum temperature occurring in July (6.4 ºC).

The highest average rainfall is recorded in February (121.7) mm, while September is the driest month (60.1 mm). Humidity in the area is relatively high, with recorded levels typically between 50 and 80 %. Wind speeds are typically higher at 3 pm compared to 9 am.

3.2.2 Wind Direction

The long-term wind rose diagrams for the Williamtown monitoring station are shown in **Appendix A**. The wind roses show the frequency of occurrence of winds by direction and strength. The bar at the top of each wind rose diagram represents winds blowing from the north (i.e. northerly winds), and so on. The length of the bar represents the frequency of occurrence of winds from that direction, and the widths of the bar sections correspond to wind speed categories, the narrowest representing the lightest winds. Winds recorded at Williamtown at 9 am blow predominantly from the west. In the afternoons, recorded winds blow predominantly from the east and southeast.

[4] Newcastle City Council. (2009). 2008/09 State of the Environment Report – The City of Newcastle.

[5] EPA. (2002). Ambient Air Quality Research Project.

4.0 Dispersion Modelling Methodology

4.1 Dispersion Model

AUSPLUME v6.0 is an advanced Gaussian plume dispersion model developed by the Victorian. AUSPLUME is approved by the OEH for use in regulatory assessments undertaken in NSW. The model uses the Gaussian dispersion model equation to simulate the dispersion of a plume from point, area, or volume sources. The model requires a meteorological data file that provides wind speed, wind direction and other dispersion parameters on an hourly basis. The plume dispersion is determined for each hour using the conventional Gaussian model assumptions.

Dispersion modelling for this assessment was undertaken in accordance with the guidelines published by the OEH[6].

4.2 Modelling Scenario

The dispersion modelling was undertaken for worst-case conditions, assuming the plant was operating at full capacity with the following operational characteristics:

- Continuous operation of the facility (24 hours per day, 7 days per week, 365 days per year);
- Continuous emissions from the truck filling operation; and
- All emissions from the site operations assessed (i.e. truck filling activities and fugitive emissions from the fuel storage tanks) tanks were assumed to be VOCs. Benzene was selected as the indicator pollutant for the assessment due to its toxicity; as such, only benzene emissions were assessed.

4.3 Assessment Criterion

The OEH criterion (DEC, 2005) and averaging period for benzene are shown in **Table 2**.

Table 2 Benzene Assessment Criterion

Pollutant	Assessment Criteria ($\mu g/m^3$)	Averaging Period	Percentile Concentration
Benzene	29	1 hour	100th*
* The 100th percentile is applicable to screening-level assessments using worst-case input data. Due to the limited lack of data available regarding fuel composition, the 100th percentile was deemed appropriate for this assessment.			

4.4 Model Inputs

AUSPLUME requires six main categories of data to determine the dispersion of pollutants:

- Meteorology;
- Terrain effects;
- Building wake effects;
- Source characteristics;
- Emissions inventory;
- Sensitive receptor locations

The above inputs are addressed separately in the following sections. The AUSPLUME modelling input file is provided in **Appendix B**.

[6] DEC (2005). Approved Methods for the Modelling and Assessment of Air Pollutants in NSW.

4.4.1 Meteorology

Hourly wind speed, wind direction, atmospheric stability class and mixed layer height data for 2009 were obtained from the OEH for their Newcastle meteorological station. Data from this site are considered to be representative of meteorological conditions around the Newcastle Harbour area. Analyses of these data are provided in **Appendix A**.

The meteorological data are used by the model in different ways to estimate the dispersion of air pollutants:

- Ambient temperature is used to incorporate thermal buoyancy effects when calculating the rise and dispersion of pollutant plumes;
- Wind direction determines the direction in which pollutants will be carried;
- Wind speed influences the dilution and entrainment of the plume into the air continuum;
- Atmospheric stability class is a measure of atmospheric turbulence and the dispersive properties of the atmosphere. Most dispersion models utilise six stability classes, ranging from A (very unstable) to F (stable/very stable); and
- Vertical mixing height is the height at which vertical mixing occurs in the atmosphere.

The long-term wind roses recorded at Williamtown and the wind roses from data collected at the OEH monitoring station in Newcastle in 2009 show similar trends for wind direction, with some minor variations. The 9 am BOM data show a higher percentage of winds from the west compared to the high percentage of north-west winds present in the OEH data. The 3 pm BOM data show a low percentage of north-west winds compared to the high percentage of north-west winds present in the OEH data. These variations are most likely caused by a difference in topography of the area, with Newcastle being influenced by hills to the south and south-east.

Due to the close proximity of the OEH Newcastle station to the proposed development, the OEH data are considered to appropriately represent the site's meteorological conditions.

4.4.2 Terrain Effects

The topographical map for Newcastle (NSW ortho-topographical map number 9232-2S) was used to assess the terrain in the area. As the terrain surrounding the site is relatively flat and featureless, a digital terrain file was not considered necessary for inclusion in the dispersion modelling.

Katabatic drainage flow (or valley drainage flow) occurs under light winds and stable meteorological conditions. As air cools at night, it falls and tends to move down-hill in areas of significant topographic relief. As this air moves it tends to create a bulk movement of air, which can cause winds to blow in areas influenced strongly by topography.

Due to the low relative relief in the region surrounding the proposed Marstel site, no significant katabatic drainage flows are expected. The regional climatic patterns, which are governed by the coastal meteorological conditions, are likely to dominate the wind patterns in the Newcastle Harbour area.

4.4.3 Building Wake Effects

The dispersion of pollutants around the proposed terminal is likely to be affected by aerodynamic wakes generated by winds having to flow around the proposed storage tanks. Building wakes generally decrease the distance downwind at which the stack plumes comes into contact with the ground. This may result in higher ground level pollutant concentrations closer to the emission source.

AUSPLUME includes the PRIME building wake algorithm and the Building Profile Input Program (BPIP) for entering the location and dimension of buildings where building wakes may be important for dispersion. The location and dimensions of buildings located within a distance of 5L (where L is the lesser of the height or width of the building) from each release point for buildings with a height greater than 0.4 times the stack height were entered in BPIP.

Aerodynamic wakes were estimated for all storage tanks and buildings affected (as defined by the OEH guidelines) by entering their dimensions and locations into the Building Profile Input Program (BPIP) utility option. The BPIP processing information is included in **Appendix B**.

4.4.4 Source Characteristics

VOCs are expected to be emitted from the truck filling stack (point source) and the storage tanks (fugitive emissions). In order to estimate the emissions parameters for the truck fillings activities, sampling was undertaken by AECOM at a similar facility in Tasmania on 19 May 2011. The measurements were taken while a tanker truck was being filled with diesel fuel. It should be noted that the tank had previously contained petrol, which may be the case with trucks attending the proposed Mayfield site. The measured parameters are shown in **Table 3**; these parameters were assumed to be the same as those for the proposed terminal. A monitoring report can be provided on request.

Table 3 Truck Filling Stack Parameters

Parameter	Value
Temperature	25 ℃
Height	8.0 m
Diameter	0.3 m
Velocity	2.0 m/s

The dimensions of the tanks to be installed at the proposed terminal are shown in **Table 4**.

Table 4 Storage Tank Details Summary

Tank Type	Number of Tanks	Diameter (m)	Height (m)
Diesel	3	36	17
Biodiesel	1	8	12

4.4.5 Emissions Inventory

As outlined in **Section 2.4.1**, the OEH does not have a criterion for total VOCs. In order to assess the effects of VOC emissions from the proposed facility, benzene was chosen as an indicator pollutant due to its toxicity. No data regarding the speciation of VOCs in the diesel and biodiesel fuel intended to be stored at the proposed facility were available at the time of this assessment. As such, a literature search was conducted to estimate the likely proportion of benzene in diesel and biodiesel fuels.

The National Pollutant Inventory provides emissions estimation manuals for use in calculating emissions from a variety of activities and plant. The emissions estimation manual for fugitive emissions[7] recommends the use of the TANKS model, and provides methods for speciating total VOC emissions. In the absence of actual composition data, the manual recommends the use of weight fraction data published by the USEPA[8]. While these data are quite old and may not accurately represent current Australian conditions, they are considered the best information currently available.

The concentrations of benzene provided in USEPA (1990) for activities associated with storage, transportation and marketing of petroleum products are shown in **Table 5**. None of the listed sources are directly comparable to the diesel or biodiesel tanks proposed for the Marstel facility. The greatest listed weight proportion of benzene was, however, 3.25 %.

[7] Environment Australia. (1999). National Pollutant Inventory Emission Estimation Technique Manual for Fugitive Emissions.
[8] USEPA. (1990). Air Emissions Species Manual – Volume 1, Volatile Organic Compound Species Profiles.

Table 5 Proportion of Benzene in VOCs from Fuels

Source	Benzene Proportion (Wt %)
Fixed roof tank - crude oil production	0.1
Fixed roof tank - crude oil refinery	2.4
Gasoline - summer blend	0.77
Gasoline - winter blend	1.58
Gasoline - marketed	3.25
Refuelling	1

The benzene content of petrol in New Zealand is around 4 %, which is comparable to the maximum proportion identified by the USEPA in **Table 5**, while many other countries now restrict the benzene content of fuel to less than one percent by volume[9]. The Australian Diesel Fuel Quality Standards do not refer to VOC content, but allow a maximum content of polycyclic aromatic hydrocarbons (PAHs, which, like VOCs are a subset of aromatic hydrocarbons, but are typically more toxic) in fuel of 11 %. In order to provide a conservative assessment, a benzene concentration of 11 % of total VOCs was assumed for both the diesel and biodiesel to be stored at the Marstel site.

The TANKS emissions estimation model was used to calculate the predicted total VOC emissions from the storage tanks using the storage tank parameters provided in **Table 6**. Output from the TANKS model is provided in **Appendix C**.

Table 6 TANKS Input Parameters

Tank Type	Approximate Size	Number
Diesel	Diameter: 36 m (118.1 ft)	3
	Height: 17 m (55.8 ft)	
	Volume: 17,303,892 L (4,570,210 gallons)	
Biodiesel	Diameter: 8 m (26.2 ft)	1
	Height: 12 m (39.4 ft)	
	Volume: 603,186 L (159,310 gallons)	

The total VOCS emitted from the diesel storage tanks was estimated to be 4,788.5 kg/year, or 0.1518 g/s. Of those emissions, 11 % were assumed to be benzene, amounting to an emission rate for benzene of 0.0167 g/s from each of the diesel tanks. Emissions from the biodiesel tank were estimated to be 754.9 kg/year of total VOCs (0.024 g/s), equating to 0.0026 g/s of benzene. Estimated emission rates used in the dispersion modelling are shown in **Table 7**.

Table 7 Emissions Rates

Parameter	Benzene Emission Rate (g/s)
Truck filing stack	0.027
Diesel tank 1	0.017
Diesel tank 2	0.017
Diesel tank 3	0.017
Biodiesel tank	0.0026

[9] New Zealand Ministry for the Environment. Good Practice Guide on Assessing Discharges to Air from land Transport, Appendix 3: Vehicle Emissions and Effects. http://www.mfe.govt.nz/publications/air/assessing-discharges-land-transport-jun06/html/page18.html; accessed 21 July 2011.

4.4.6 Sensitive Receptors

The OEH considers sensitive receptors to be areas where people are likely to either live or work, or engage in recreational activities. On this basis, representative receptors were placed at various locations surrounding the proposed terminal in the dispersion model.

A summary of the approximate receptor locations is shown below in **Table 8**; the locations are shown in **Figure 1**. Maximum benzene concentrations were determined at the each sensitive receptor location.

Table 8 Sensitive Receptor Locations

Receptor No.	Receptor Description	Type
1	Selwyn St, Mayfield	Commercial
2	George Bp. Drive, Mayfield	Industrial
3	Selwyn St, Mayfield	Commercial
4	Industrial Drive and Crebert St Crossroad, Mayfield	Residential
5	Industrial Drive, Mayfield	Residential
6	Industrial Drive and Ingall St Crossroad, Mayfield	Residential
7	Dead end of Arthur St, Mayfield	Residential
8	Industrial Drive and George Street Crossroad, Mayfield	Residential
9	George Street and Margaret Street Crossroad, Mayfield	Residential
10	Crebert Street and Ingall Street Crossroad, Mayfield	Residential
11	Havelock Street and Crebert Street T-intersection, Mayfield	Residential
12	Phoenix Sports Club, Mayfield	Commercial
13	Industrial Drive and Bull Street T-intersection, Mayfield	Residential
14	Kerr Street dead end, Mayfield	Residential
15	Cormorant Road, Mayfield	Industrial
16	Cormorant Road, Mayfield	Industrial
17	Greenleaf Road, Mayfield	Industrial

5.0 Modelling Results and Impact Assessment

The results of the dispersion modelling are summarised in **Table 9**, which lists the 100th percentile concentrations of benzene predicted by the dispersion model the specified sensitive receptor locations. Concentrations of benzene resulting from the facility's estimated emissions and cumulative concentrations (i.e. including existing background benzene concentrations) are shown. An isopleth plot of the predicted concentrations is shown in **Figure 2**; it should be noted that the contours shown in **Figure 2** represent emissions from the facility alone rather than cumulative concentrations.

Table 9 Predicted Ground Level Concentrations of Benzene (µg/m^3) at Sensitive Receptor Locations

Receptor Number	Predicted Benzene Concentration (µg/m^3)	
	Facility Only	Cumulative Concentrations
1	5.6	8.2
2	8.7	11.3
3	3.6	6.2
4	3.9	6.5
5	3.5	6.1
6	2.5	5.1
7	2.5	5.1
8	2.6	5.2
9	2.6	5.2
10	2.7	5.3
11	1.8	4.4
12	2.1	4.7
13	1.7	4.3
14	1.8	4.4
15	5.0	7.6
16	3.4	6.0
17	4.1	6.7
Criterion	**29**	

Benzene concentrations for the area surrounding the proposed terminal were predicted to fall well below the assessment criterion at all modelled sensitive receptor locations. It should be noted that the assessment was conservative – the modelling assumed the facility was emitting benzene continuously, and emission rates were conservatively estimated at rates expected to be around three times higher than actual likely emissions. As benzene was used as an indicator pollutant, the results suggest no adverse impacts are likely to occur from emissions of VOCs from the proposed facility.

6.0 Greenhouse Gas Assessment

Greenhouse gases (GHGs) are gases found in the atmosphere that absorb outgoing heat that is reflected from the sun. The primary greenhouse gas is carbon dioxide (CO_2). Different GHGs have different heat absorbing capacities. In order to achieve a basic unit of measurement, each GHG is compared to the absorptive capacity of CO_2, and measurements and estimates of GHG levels are reported in terms of CO_2 equivalent emissions (CO_2-e).

Australia's National Greenhouse Gas Inventories are designed to provide estimates of Australia's net GHG emissions and track Australia's progress towards its internationally-agreed GHG reduction targets. Australia has published annual national GHG inventories for each year from 1990 to 2009 inclusive. In 2009 (the latest available data), Australia's total GHG emissions were estimated to be 564.5 Mt CO_2-e. Of these emissions, approximately 8 % (44.8 Mt CO_2-e) were attributed to the transport and storage sector[10].

Estimation of the GHG emissions associated with the proposed terminal's operations was undertaken using the emission factors and methods outlined in the NGA Factors[11]. The NGA Factors provide three types of assessment categories:

- **Scope 1**, which covers direct emissions from sources within the boundary of an organisation, such as fuel combustion and manufacturing processes;
- **Scope 2**, which covers indirect emissions from the consumption of purchased electricity, steam or heat produced by another organisation; and
- **Scope 3**, which includes all other indirect emissions that are a consequence of an organisation's activities but are not from sources owned or controlled by the organisation; that is, emissions associated with the production of fuels, and emissions from the generation of purchased electricity.

The main operations likely to generate GHGs at the proposed terminal are:

- Electricity to run plant operations such as administration buildings, fuel pumps, and plant lighting (Scopes 2 and 3);
- Delivery and distribution of fuels via road and ship tanker (Scope 3);
- Passenger vehicles transporting staff to and from site (Scope 3); and
- Combustion of fuel distributed from the facility (Scope 3).

Estimation of emissions associated with these activities was undertaken; results are reported in the following sections.

6.1 Electricity Consumption

The facility was assumed to use 204,000 kWh of electricity per year. Emissions of GHGs associated with this consumption were estimated at approximately 216 t CO_2-e per year as shown in **Table 11**.

Table 10 GHG Emissions from Electricity Use

Emissions Type	Emission Factor* (kg CO_2-e/kWh)	GHG Emissions (t CO_2-e)
Scope 2	0.89	181.6
Scope 3	0.17	34.7
Full Fuel Cycle (total)	**1.06**	**216.2**
* Latest estimate for consumption of electricity in NSW. Source: Table 39, NGA Factors, July 2011		

[10] Department of Climate Change and Energy Efficiency. (2011). Australian National Greenhouse Accounts – National Inventory by Economic Sector 2009. Commonwealth of Australia
[11] Department of Climate Change and Energy Efficiency. (2011). National Greenhouse Accounts Factors, July 2011.

6.2 Fuel Consumption

While emissions associated with the delivery and dispatch of fuel and staff commuting could be argued to be indirect as they will not be under the direct control of Marstel (i.e. Scope 3) emissions, these activities were conservatively assessed as Scope 1 emissions.

6.2.1 Delivery and Dispatch of Fuel

The GHG estimates were made assuming delivery and dispatch trucks would be rigid diesel tankers, with 5,103 trucks per annum for diesel dispatch and 1,134 trucks per annum for biodiesel receipt and dispatch. Each truck was assumed to travel 200 km, with a fuel consumption rate of 0.285 L/km[12]. Total emissions associated with truck movements were estimated to be 959 t CO_2-e per year as shown in **Table 11**.

Table 11 Scope 1 Emissions - Delivery and Dispatch of Fuels by Truck

Greenhouse Gas	Emission Factor (kg CO_2-e/GJ)	Energy Content Factor (Diesel) (GJ/kL)	Emissions (t CO_2-e/year)
CO_2	69.2	38.6	950
CH_4	0.2		3
N_2O	0.5		7
Total			**959**
* Source: Table 4, NGA Factors, July 2011			

The estimated emissions associated with the delivery of diesel by ship are shown in **Table 12**. The diesel was assumed to be delivered by 15 ships per year, with each tanker travelling for two days in total. Each ship was assumed to burn approximately 36 tonnes of diesel fuel per day[13], resulting in a total annual fuel consumption of around 1,000 kL per year. Emissions associated with shipping were estimated at 2,857 t CO_2-e per year.

Table 12 Scope 1 Emissions - Delivery of Diesel by Ship

Greenhouse Gas	Emission Factor (kg CO_2-e/GJ)	Energy Content Factor (Diesel) (GJ/kL)	Emissions (t CO_2-e/year)
CO_2	69.2	38.6	2,828
CH_4	0.2		8.2
N_2O	0.5		20.4
Total			**2,857**
* Source: Table 4, NGA Factors, July 2011			

6.2.2 Staff Movements

Emissions associated with staff commuting to and from the site were estimated as shown in **Table 13**, assuming that 3 petrol-powered cars would be driven 20 km each way to the site for 5 days per week. A conservative fuel consumption rate of 0.19 L/km[14] was assumed, leading to a total estimated fuel consumption of 5.93 kL per year. Total commuting emissions were estimated at 14 t CO_2-e per year.

[12] VicRoads GHG Calculator Spreadsheet; references Australian greenhouse Office Factors and Methods Workbook, December 2006.
[13] Fuel consumption of ship taken from Stopford, M. (1997). Maritime Economics, Routledge.
[14] Fuel Consumption Guide Database 1986 - 2003. Consumption rate provided represents maximum consumption rate of all passenger vehicles excluding luxury models by Bentley, Rolls Royce and Ferrari.

Table 13 Scope 1 Emissions – Passenger Vehicles for Commuting Staff

Greenhouse Gas	Emission Factor (kg CO_2-e/GJ)	Energy Content Factor (Gasoline) (GJ/kL)	Emissions (t CO_2-e/year)
CO_2	66.7	34.2	13.5
CH_4	0.6		0.1
N_2O	2.3		0.4
Total			**14**
* Source: Table 4, NGA Factors, July 2011			

6.2.3 Consumption of Marstel Fuel by End Users

Indirect emissions of GHGs will also occur due to the use of the fuels distributed by the facility. These Scope 3 emissions were estimated as shown in **Table 14**.

The NGA Factors do not provide Scope 3 emission factors for biodiesel fuels as the emissions are highly dependent on individual plant and project characteristics. Previously published data indicate that the emission factors and associated emissions from biodiesel are lower than for diesel[15]. As such, for this assessment, the emission factor for Scope 3 emissions from the consumption of the biodiesel fuel was conservatively assumed to be the same as that for diesel fuel consumption, i.e. 5.3 kg CO_2-e/GJ. Total emissions associated with consumption of the fuel supplied by Marstel were estimated to be 118,038 t CO_2-e per year.

Table 14 Scope 3 Emissions - Consumption of Fuel Distributed by Proposed Facility

Fuel Type	Emission Factor* (kg CO_2-e/GJ)	Energy Content Factor ^ (GJ/kL)	Throughput		GHG Emissions (t CO_2-e/year)
			ML	kL	
Diesel	5.3	38.6	264	264,000	54,009
Biodiesel	5.3	34.6	36	36,000	6,602
Total					**60,611**
* Table 38, NGA Factors, July 2011 ^ Table 4, NGA Factors, July 2011					

6.3 Emissions Summary

The total estimated GHG emissions associated with operation of the proposed facility is shown in **Table 15**. As shown, the total emissions were estimated at 0.06 Mt CO_2-e per year, equating to approximately 0.01 % of the total Australian emissions (564.5 Mt CO_2-e) and 0.1 % of the total transport emissions in Australia in 2009 (44.8 Mt CO_2-e). The greatest contributor to emissions was the consumption of the fuel supplied by Marstel by end users.

The relationship between GHG concentrations and climate change is very complex and nonlinear. As such, the effect of the emission of this amount of GHGs on the environment or climate change cannot be estimated. The proposed project represents a very minor source of GHG emissions, both in terms of the economic sector emissions and Australia's national emissions. Furthermore, the proposed project may potentially decrease net GHG transportation emissions as the proposed facility will be located closer to its markets than current fuel providers, thereby reducing the truck transportation distance required to supply fuel to service stations. Bulk fuel transportation via ships allows efficient fuel transport to the Port of Newcastle and shorter distribution corridors from Mayfield. As such, the proposed project is not expected to significantly affect the environment.

[15] Biodiesel emissions ranged from 0.3 - 2.7 kg CO_2-e/L (NGA Factors January 2008, as cited in VicRoads' GHG Calculator). In comparison, the emission factor for scope 3 emissions from diesel fuel at the same time was 2.9 CO_2-e/L.

Table 15 Greenhouse Gas Emissions Summary

Activity	Estimated GHG Emissions (t CO_2-e/year)
Electricity consumption	216
Fuel consumption – delivery and dispatch (truck)	959
Fuel consumption – delivery (ship)	2,857
Fuel consumption – staff commuting	14
Fuel consumption by end users	60,611
Total GHG emissions	**64,657**

7.0 Conclusion

AECOM conducted an assessment of the potential effects on air quality and GHG emissions associated with the proposed bulk liquid fuel storage terminal at Mayfield, NSW. The proponent, Marstel, proposes to import, store and distribute diesel and biodiesel fuels. The proposed project involves the receival of 264 ML of diesel fuel per year via ship and approximately 36 ML of biodiesel fuel per year by truck. All fuels would be dispatched from the site by truck. The facility would have the capacity to store up to 54 ML of diesel and 500 m^3 of biodiesel.

This assessment investigated the air quality impacts of the proposed project on surrounding receivers, and estimated the potential emissions of GHGs associated with the facility's activities. The assessment of air emissions was limited to VOCs during operation of the proposed facility, as emissions associated with construction works for the project would be expected to be easily managed through standard construction practices, and odour was not considered likely to be an issue at sensitive receptor locations due to the fuels proposed to be stored and the distance between the facility and sensitive receptors. Benzene was chosen as an indicator species for VOCs, and was the only pollutant modelled. Benzene concentrations at sensitive receptor locations were estimated through dispersion modelling using the AUSPLUME program.

The results of the conservative modelling predicted that cumulative benzene concentrations would reach less than 40 % of the OEH guideline criterion at any sensitive receptor location. As such, no significant air pollutant impacts on the surrounding environment would be expected from the proposed development.

The GHG assessment considered emissions associated with electricity and fuel consumption. Fuel consumption included fuel use for the delivery and dispatch of fuels to/from the site by truck and ship; fuel used by staff commuting to and from the site; and the consumption of the fuel by customers. The burning of Marstel's product fuel was the source of 94 % of the total GHG emissions associated with the proposed facility, amounting to an estimated 0.060 Mt CO_2-e per year. The facility's total GHG emissions (0.064 Mt CO_2-e per year) were found to represent a very small proportion (0.1 %) of emissions from the transport sector (44.8 Mt CO_2-e per year) and Australian emissions as a whole (0.01 % of 564.5 Mt CO_2-e). Additionally, the proposed project may serve to decrease net GHG transport emissions as the proposed facility will be located closer to its markets than current fuel providers, thereby reducing the truck transportation distance required to supply fuel to service stations. The proposed project is not, therefore, expected to significantly adversely affect the environment.

Appendix A

Climate and Meteorological Data

Appendix A Climate and Meteorological Data

The long-term climate averages recorded at the BOM station at Williamtown between 1942 and 2010 are shown in **Table A1**.

Table A.1 – Long Term Climate Averages, BOM Williamtown (1942-2010)

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Temperature													
Mean maximum temperature (°C)	28.0	27.5	26.2	23.6	20.3	17.6	17.0	18.6	21.3	23.6	25.4	27.2	23.0
Mean minimum temperature (°C)	18.0	18.1	16.3	13.2	10.1	7.9	6.4	6.8	9.1	12.0	14.3	16.5	12.4
Rainfall													
Mean rainfall (mm)	97.9	121.7	121.1	104.5	114.5	121.4	72.3	75.8	60.1	74.5	81.0	79.9	1122.4
Decile 5 (median) rainfall (mm)	79.2	97.5	113.0	81.0	101.8	101.6	72.8	60.2	49.7	56.2	81.8	62.3	1089.8
Mean number of days of rain ≥ 1 mm	7.2	7.3	8.2	7.3	8.0	8.1	6.4	6.2	5.7	7.4	7.4	7.0	86.2
9 am Conditions													
Mean 9am temperature (°C)	23	22.5	21.2	18.2	14.3	11.6	10.5	12.2	15.7	18.8	20.5	22.2	17.6
Mean 9am relative humidity (%)	72	76	77	76	79	80	77	71	66	64	66	68	73
Mean 9am wind speed (km/h)	11.9	10.6	10.2	11.4	13.7	15.9	16.4	16.8	15.3	14.4	14.4	12.9	13.7
3 pm Conditions													
Mean 3pm temperature (°C)	26.5	26.1	24.9	22.5	19.3	16.8	16.2	17.6	20	21.9	23.8	25.6	21.8
Mean 3pm relative humidity (%)	59	62	61	59	60	60	55	50	50	54	55	56	57
Mean 3pm wind speed (km/h)	21.9	20.6	18.9	17.2	15.8	17.5	18.7	20.9	22	22.5	23.5	23.5	20.2

Wind rose diagrams of the meteorological data measured at the Newcastle OEH monitoring station in 2009 are shown in below. The wind roses show the frequency of occurrence of winds by direction and strength. Each wind rose arm represents a wind blowing from the direction it is projected i.e. arm pointing up represents northerly winds. The length of the bar represents the frequency of occurrence of winds from that direction, and wind speed categories are defined by different colours.

As shown in **Figure A1**, the winds for the Newcastle area are generally dominated by winds from the northwest/ southeast axis. These patterns are confirmed by wind roses prepared for the Bureau of Meteorology (BOM) station at Williamtown, with some minor variations most likely due to different topography (**Figures A2** and **A3**).

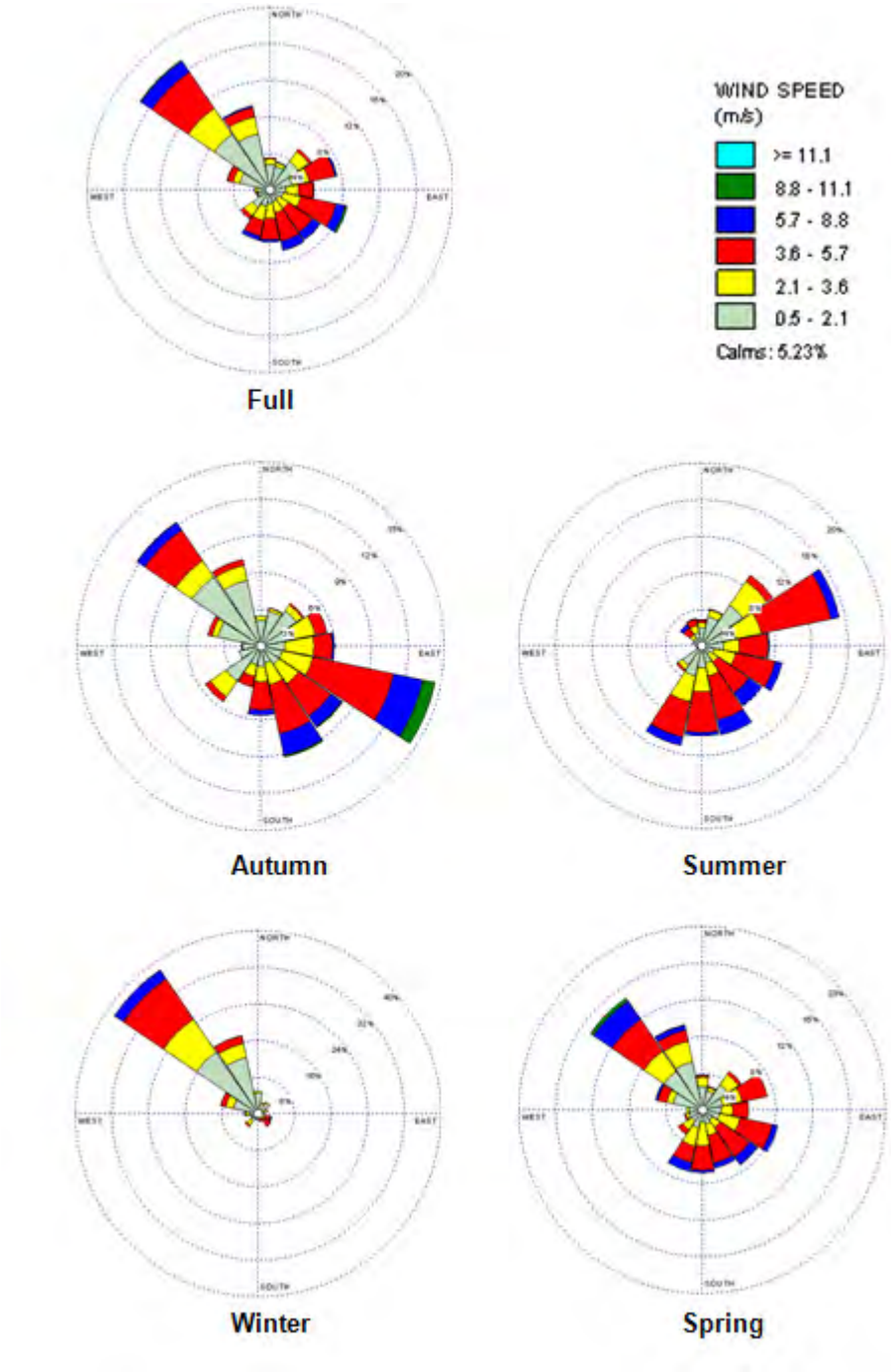


Figure A1: Full Year and Seasonal Wind Roses – Newcastle OEH Monitoring Station, 2009

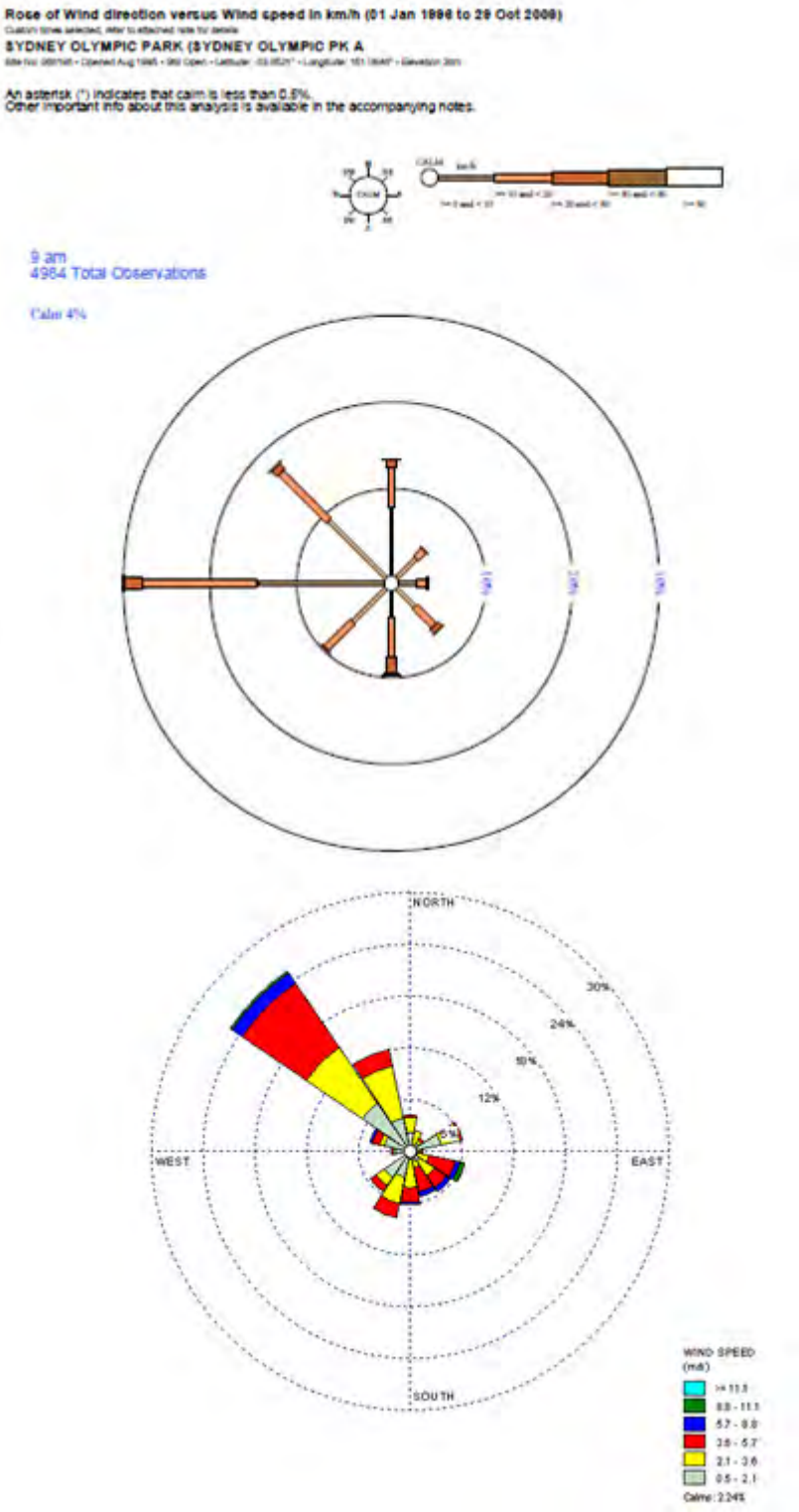


Figure A2: 9 am Wind Roses – Williamtown (top; 1998 - 2009) and Newcastle OEH (bottom, 2009).

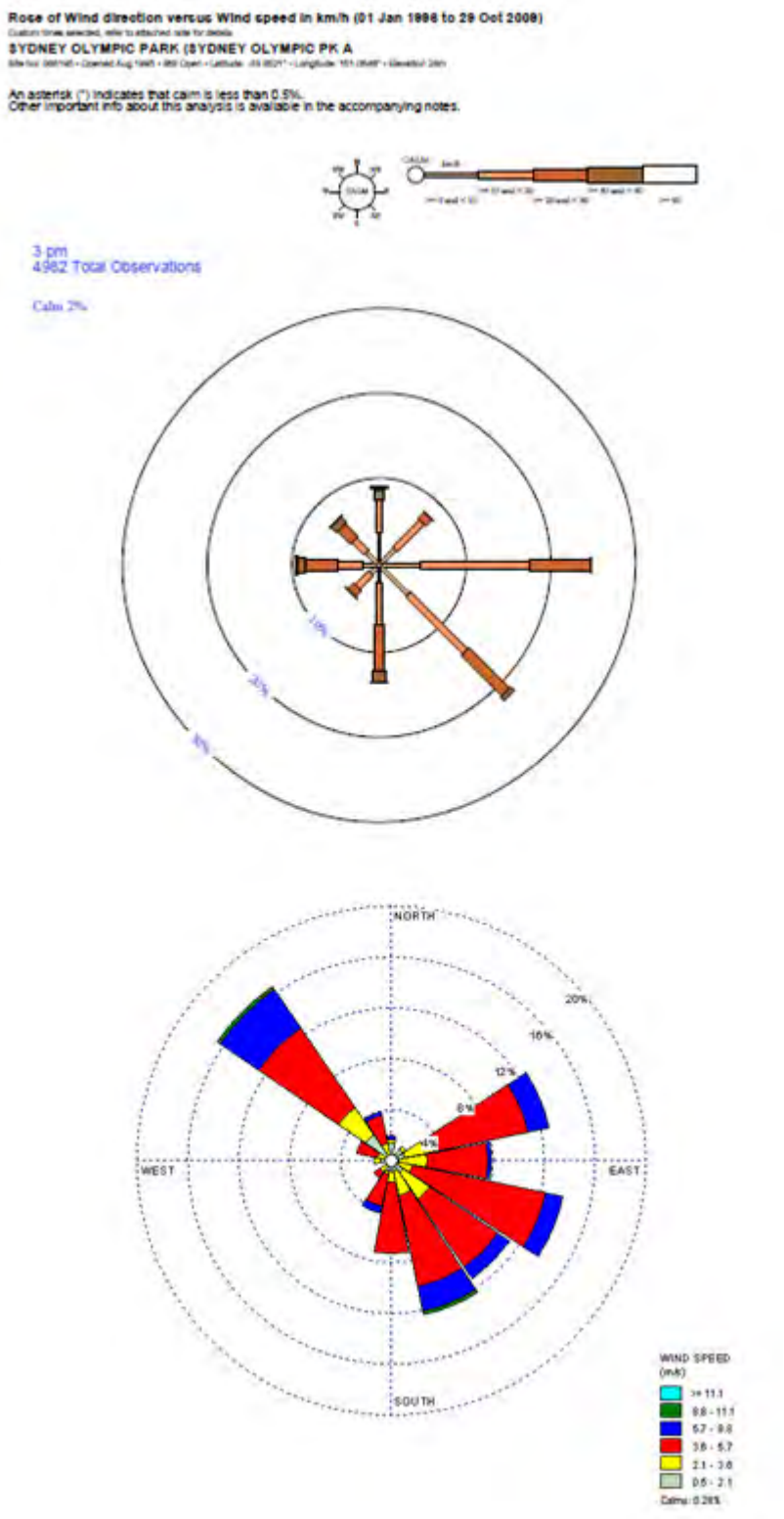


Figure A3: 3 pm Wind Roses – Williamtown (top; 1998 - 2009) and Newcastle OEH (bottom, 2009).

Wind Speed

The estimated mean wind speed for the year at the Newcastle station is 2.8 m/s with a calm wind (≤ 0.5 m/s) percentage of 4%. The frequency distribution of hourly averaged wind speed values from the Newcastle data is shown in **Figure A4**. Wind speeds up to and including 6 m/s occurred approximately 96 % of the time.

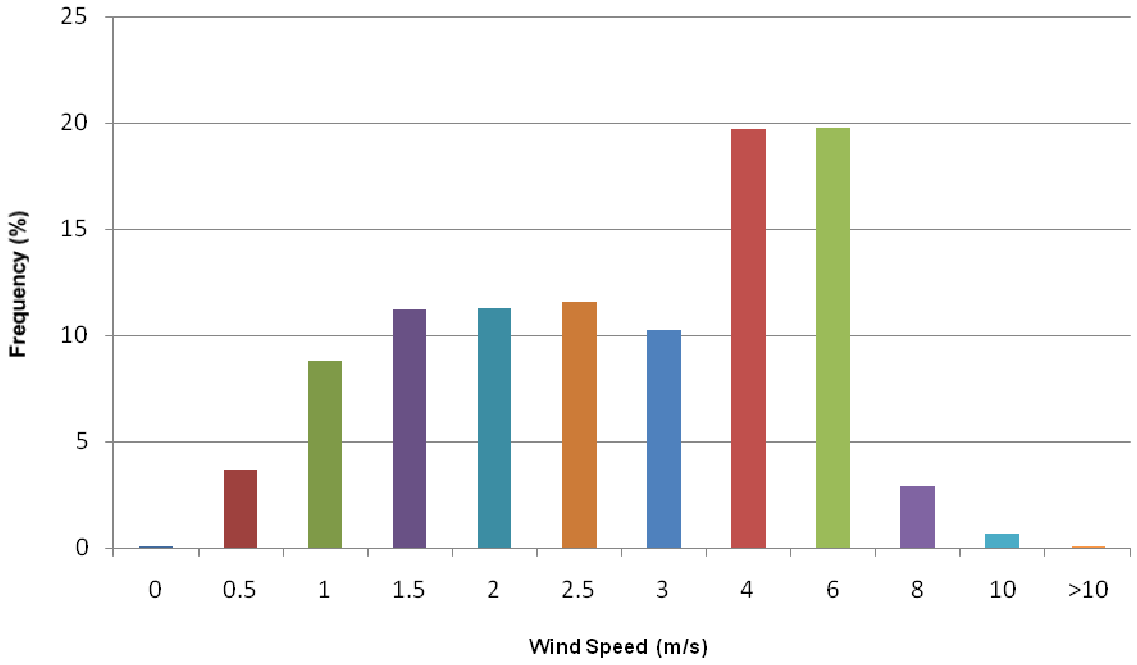


Figure A4: Frequency Distribution of Wind Speed

Stability Class

An important aspect of plume dispersion is the atmospheric turbulence level in the region of the plume (near the ground in this case). Turbulence acts to increase the cross-sectional area of the plume due to random motions, thus diluting or diffusing a plume. For traditional dispersion modelling using Gaussian plume models, categories of atmospheric stability are used in conjunction with other meteorological data to describe atmospheric conditions and thus dispersion.

The most well-known stability classification is the Pasquill-Gifford scheme, which denotes stability classes from A to F. Class A is described as highly unstable and occurs in association with strong surface heating and light winds, leading to intense convective turbulence and much enhanced plume dilution. At the other extreme, class F denotes very stable conditions associated with strong temperature inversions and light winds, which commonly occur under clear skies at night and in the early morning. Under these conditions, plumes can remain relatively undiluted for considerable distances downwind. Intermediate stability classes grade through moderately unstable (B), slightly unstable (C), neutral (D) to slightly stable (E). Whilst classes A and F are strongly associated with clear skies, class D is linked to windy and/or cloudy weather, and short periods around sunset and sunrise when surface heating or cooling is small.

As a general rule, unstable (or convective) conditions dominate during the daytime and stable flows are dominant at night. This diurnal pattern is most pronounced when there is relatively little cloud cover and light to moderate winds. The frequency distribution of estimated stability classes in the meteorological file is shown in **Figure A5**. The data show a relatively even spread of classes with a higher trend towards neutral winds. The breakdown of classes was 25 % for A and B (unstable), 47 % for C and D (neutral) and 28 % for E and F (stable) class.

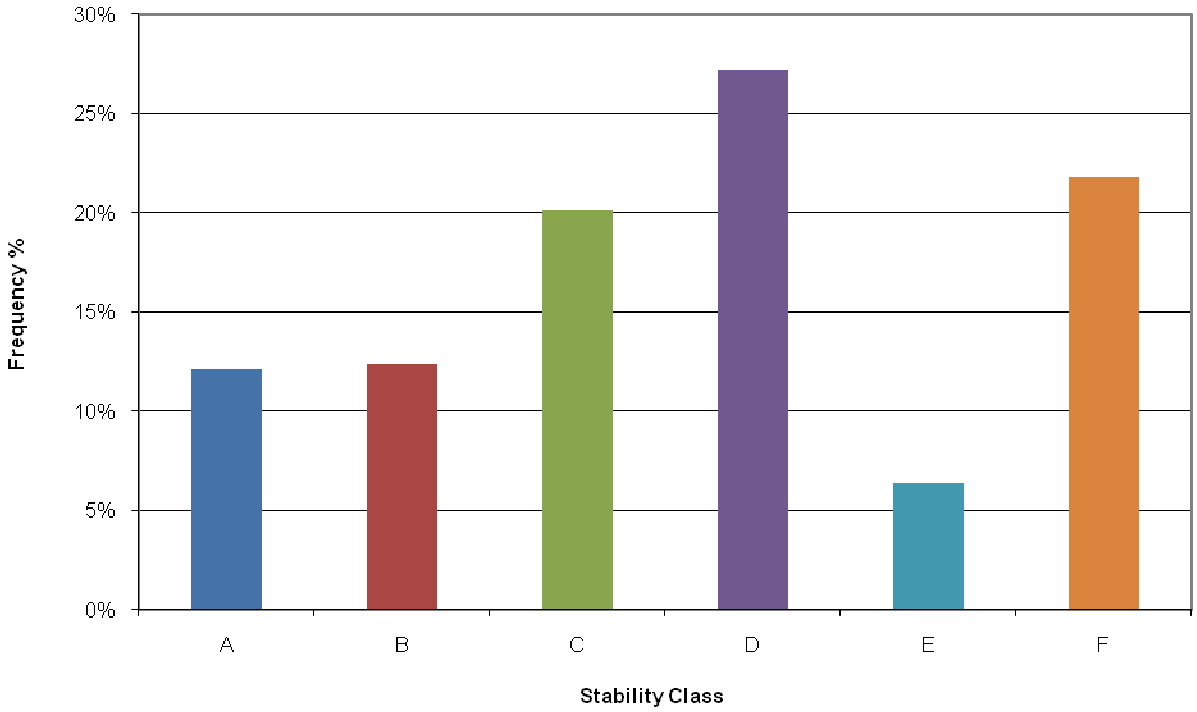


Figure A5: Frequency Distribution of Stability Class

Mixing Height

Mixing height is the depth of the atmospheric surface layer beneath an elevated temperature inversion. It is an important parameter within air pollution meteorology. Vertical diffusion or mixing of a plume is generally considered to be limited by the mixing height, as the air above this layer tends to be stable, with restricted vertical motions.

The diurnal variation of mixing height for the predicted data is summarised in **Figure A6**. The average mixing heights are lower during the night and early morning hours (< 2000 m), increasing after sunrise to an average of around 4000 m by mid-afternoon. This pattern of a diurnal cycle is consistent with expectations.

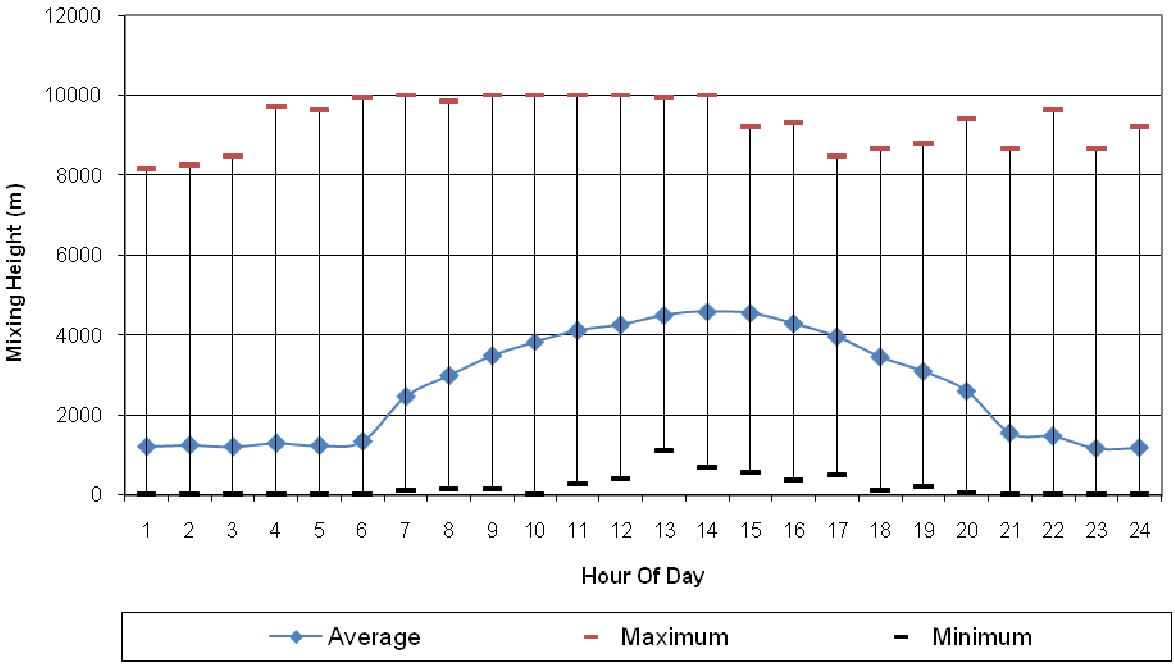


Figure A6: Hourly Mixing Height

Air Temperature

Figure A7 shows the hourly average temperature follows the expected daily diurnal cycle.

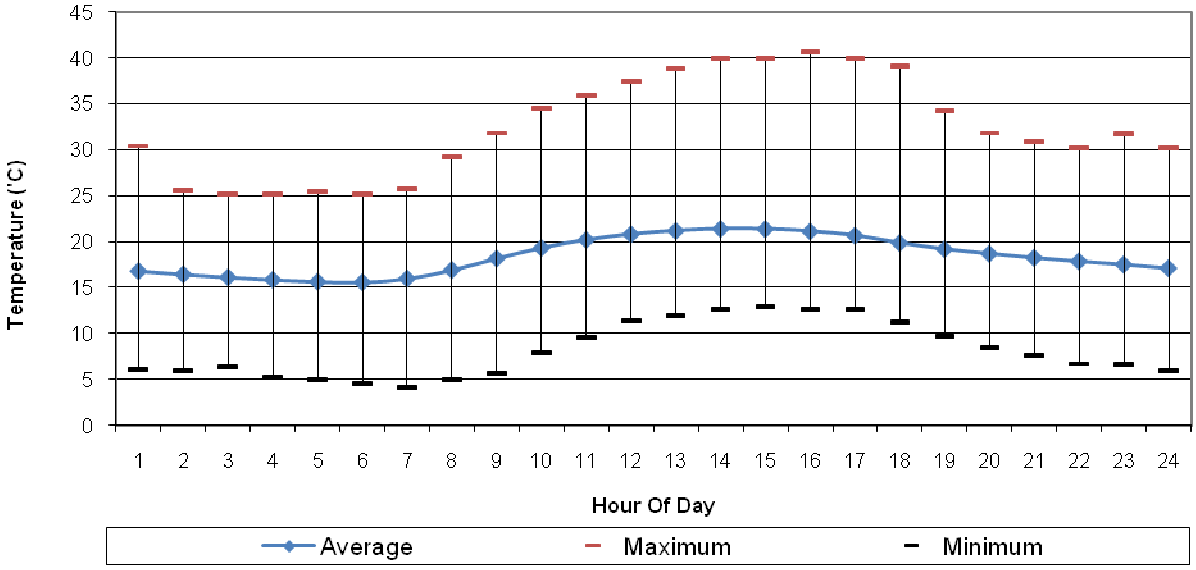


Figure A7: Hourly Temperature Values

Figure A8 shows a comparison between the yearly average temperatures for the long term BOM Williamtown data and the Newcastle OEH 2009 data. The data show a good comparison between the two sites, suggesting that the 2009 data are a good representation of the regional climate.

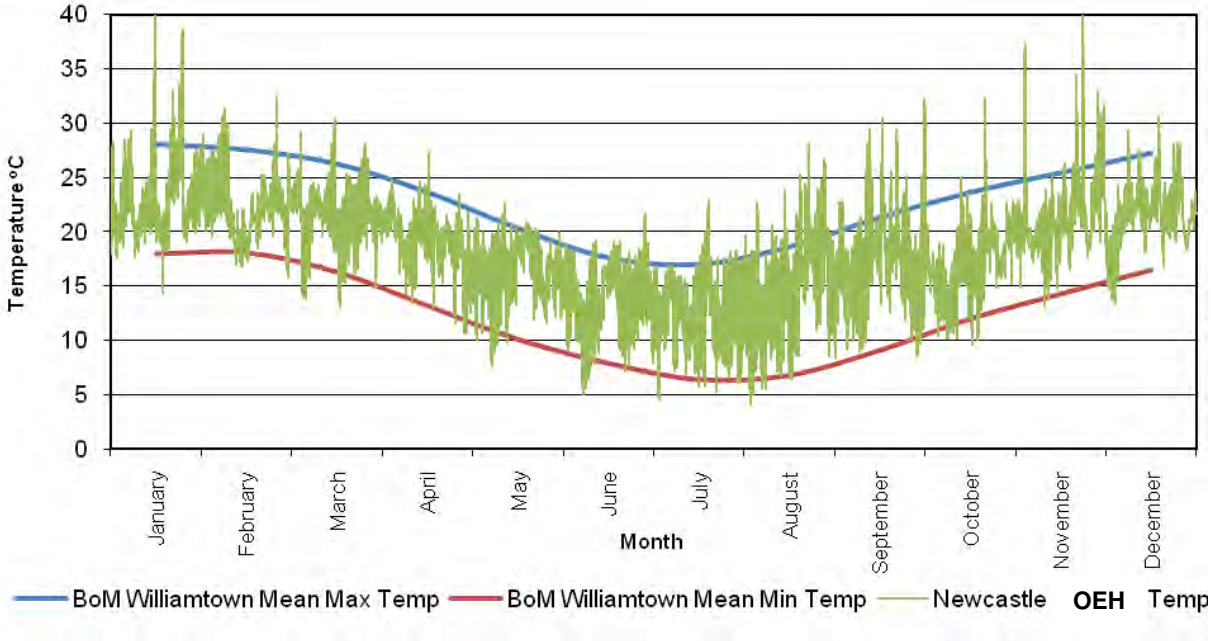


Figure A8: Yearly Temperature Comparison of BOM and OEH Data

Appendix B

AUSPLUME Modelling Files

1

Marstel AQIA 1 July 2011 - VOCs

Concentration or deposition	Concentration
Emission rate units	grams/second
Concentration units	microgram/m3
Units conversion factor	1.00E+06
Constant background concentration	0.00E+00
Terrain effects	None
Smooth stability class changes?	No
Other stability class adjustments ("urban modes")	None
Ignore building wake effects?	No
Decay coefficient (unless overridden by met. file)	0.000
Anemometer height	10 m
Roughness height at the wind vane site	0.300 m
Averaging time for sigma-theta values	60 min.

DISPERSION CURVES

Horizontal dispersion curves for sources <100m high	Sigma-theta
Vertical dispersion curves for sources <100m high	Pasquill-Gifford
Horizontal dispersion curves for sources >100m high	Briggs Rural
Vertical dispersion curves for sources >100m high	Briggs Rural
Enhance horizontal plume spreads for buoyancy?	Yes
Enhance vertical plume spreads for buoyancy?	Yes
Adjust horizontal P-G formulae for roughness height?	Yes
Adjust vertical P-G formulae for roughness height?	Yes
Roughness height	0.400m
Adjustment for wind directional shear	None

PLUME RISE OPTIONS

Gradual plume rise?	Yes
Stack-tip downwash included?	Yes
Building downwash algorithm:	PRIME method.
Entrainment coeff. for neutral & stable lapse rates	0.60,0.60
Partial penetration of elevated inversions?	No
Disregard temp. gradients in the hourly met. file?	No

and in the absence of boundary-layer potential temperature gradients given by the hourly met. file, a value from the following table (in K/m) is used:

Wind Speed Category	Stability Class A	B	C	D	E	F
1	0.000	0.000	0.000	0.000	0.020	0.035
2	0.000	0.000	0.000	0.000	0.020	0.035
3	0.000	0.000	0.000	0.000	0.020	0.035
4	0.000	0.000	0.000	0.000	0.020	0.035
5	0.000	0.000	0.000	0.000	0.020	0.035
6	0.000	0.000	0.000	0.000	0.020	0.035

WIND SPEED CATEGORIES
Boundaries between categories (in m/s) are: 1.54, 3.09, 5.14, 8.23, 10.80

WIND PROFILE EXPONENTS: "Irwin Urban" values (unless overridden by met. file)

AVERAGING TIMES
1 hour

1

Marstel AQIA 1 July 2011 - VOCs

SOURCE CHARACTERISTICS

STACK SOURCE: BENZNE

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
83719	60311	0m	8m	0.30m	25C	2.0m/s

Effective building dimensions (in metres)

Flow direction	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°
Effective building width	0	0	0	33	33	32	32	32	30	32	32	49
Effective building height	0	0	0	17	17	17	17	17	17	17	17	12
Along-flow building length	0	0	0	31	32	33	32	32	32	33	31	33
Along-flow distance from stack	0	0	0	-52	-55	-56	-56	-55	-94	-53	-95	-45
Across-flow distance from stack	0	0	0	22	15	7	1	-5	15	-18	-14	-23

Flow direction	130°	140°	150°	160°	170°	180°	190°	200°	210°	220°	230°	240°
Effective building width	49	0	0	0	0	0	0	0	0	33	33	32
Effective building height	12	0	0	0	0	0	0	0	0	17	17	17
Along-flow building length	33	0	0	0	0	0	0	0	0	31	32	33
Along-flow distance from stack	-39	0	0	0	0	0	0	0	0	21	23	24
Across-flow distance from stack	-27	0	0	0	0	0	0	0	0	-22	-15	-7

Flow direction	250°	260°	270°	280°	290°	300°	310°	320°	330°	340°	350°	360°
Effective building width	32	32	31	32	43	49	49	0	0	0	0	0
Effective building height	17	17	17	17	17	12	12	0	0	0	0	0
Along-flow building length	32	32	33	33	77	33	33	0	0	0	0	0
Along-flow distance from stack	24	23	22	20	18	12	6	0	0	0	0	0
Across-flow distance from stack	-1	5	12	18	20	23	27	0	0	0	0	0

(Constant) emission rate = 2.72E-02 grams/second
No gravitational settling or scavenging.

VOLUME SOURCE: D1-BE

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
83679	60298	0m	17m	36m	2m

(Constant) emission rate = 1.67E-02 grams/second
No gravitational settling or scavenging.

VOLUME SOURCE: D2-BE

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
83641	60324	0m	17m	36m	2m

(Constant) emission rate = 1.67E-02 grams/second
No gravitational settling or scavenging.

VOLUME SOURCE: D3-BE

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
83601	60348	0m	17m	36m	2m

(Constant) emission rate = 1.67E-02 grams/second
No gravitational settling or scavenging.

VOLUME SOURCE: BD1-BE

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
83697	60320	0m	12m	8m	2m

(Constant) emission rate = 2.60E-03 grams/second
No gravitational settling or scavenging.

1

Marstel AQIA 1 July 2011 - VOCs

RECEPTOR LOCATIONS

The Cartesian receptor grid has the following x-values (or eastings):

81090.m	81140.m	81190.m	81240.m	81290.m	81340.m	81390.m
81440.m	81490.m	81540.m	81590.m	81640.m	81690.m	81740.m
81790.m	81840.m	81890.m	81940.m	81990.m	82040.m	82090.m
82140.m	82190.m	82240.m	82290.m	82340.m	82390.m	82440.m
82490.m	82540.m	82590.m	82640.m	82690.m	82740.m	82790.m
82840.m	82890.m	82940.m	82990.m	83040.m	83090.m	83140.m
83190.m	83240.m	83290.m	83340.m	83390.m	83440.m	83490.m
83540.m	83590.m	83640.m	83690.m	83740.m	83790.m	83840.m
83890.m	83940.m	83990.m	84040.m	84090.m	84140.m	84190.m
84240.m	84290.m	84340.m	84390.m	84440.m	84490.m	84540.m
84590.m	84640.m	84690.m	84740.m	84790.m	84840.m	84890.m
84940.m	84990.m	85040.m	85090.m	85140.m	85190.m	85240.m
85290.m	85340.m	85390.m	85440.m	85490.m	85540.m	85590.m
85640.m	85690.m	85740.m	85790.m	85840.m	85890.m	85940.m
85990.m	86040.m	86090.m				

and these y-values (or northings):

58315.m	58365.m	58415.m	58465.m	58515.m	58565.m	58615.m
58665.m	58715.m	58765.m	58815.m	58865.m	58915.m	58965.m
59015.m	59065.m	59115.m	59165.m	59215.m	59265.m	59315.m
59365.m	59415.m	59465.m	59515.m	59565.m	59615.m	59665.m
59715.m	59765.m	59815.m	59865.m	59915.m	59965.m	60015.m
60065.m	60115.m	60165.m	60215.m	60265.m	60315.m	60365.m
60415.m	60465.m	60515.m	60565.m	60615.m	60665.m	60715.m
60765.m	60815.m	60865.m	60915.m	60965.m	61015.m	61065.m
61115.m	61165.m	61215.m	61265.m	61315.m	61365.m	61415.m
61465.m	61515.m	61565.m	61615.m	61665.m	61715.m	61765.m
61815.m	61865.m	61915.m	61965.m	62015.m	62065.m	62115.m
62165.m	62215.m	62265.m	62315.m			

DISCRETE RECEPTOR LOCATIONS (in metres)

No.	X	Y	ELEVN	HEIGHT	No.	X	Y	ELEVN	HEIGHT
1	83764	59312	0.0	0.0	10	82888	59545	0.0	0.0
2	83284	60562	0.0	0.0	11	82556	59606	0.0	0.0

3	83463	59379	0.0	0.0	12	82520	60016	0.0	0.0
4	83257	59487	0.0	0.0	13	82100	60170	0.0	0.0
5	83122	59676	0.0	0.0	14	81998	60356	0.0	0.0
6	82896	59734	0.0	0.0	15	84535	60622	0.0	0.0
7	82693	59982	0.0	0.0	16	85055	60439	0.0	0.0
8	83385	59057	0.0	0.0	17	85314	59768	0.0	0.0
9	83004	59120	0.0	0.0					

METEOROLOGICAL DATA : Metdata Newcastle DECCW Site 2009

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1 Peak values for the 100 worst cases (in microgram/m3)
Averaging time = 1 hour

Rank	Value	Time Recorded hour,date	Coordinates (* denotes polar)		
1	1.24E+02	16,03/09/09	(83690,	60315,	0.0)
2	1.11E+02	06,11/12/09	(83690,	60315,	0.0)
3	1.03E+02	03,11/12/09	(83840,	60265,	0.0)
4	1.03E+02	07,11/12/09	(83690,	60315,	0.0)
5	1.02E+02	08,08/04/09	(83690,	60315,	0.0)
6	1.01E+02	04,27/11/09	(83940,	60315,	0.0)
7	9.98E+01	06,13/12/09	(83690,	60315,	0.0)
8	9.95E+01	24,07/01/09	(83690,	60315,	0.0)
9	9.59E+01	08,08/08/09	(83690,	60315,	0.0)
10	9.56E+01	23,25/03/09	(83690,	60315,	0.0)
11	9.44E+01	21,30/08/09	(83690,	60315,	0.0)
12	9.35E+01	13,28/12/09	(83690,	60315,	0.0)
13	9.33E+01	07,29/04/09	(83690,	60315,	0.0)
14	9.30E+01	22,10/04/09	(83840,	60415,	0.0)
15	9.30E+01	11,24/06/09	(83690,	60315,	0.0)
16	9.28E+01	24,07/03/09	(83840,	60415,	0.0)
17	9.26E+01	11,18/08/09	(83690,	60315,	0.0)
18	9.18E+01	09,22/08/09	(83690,	60315,	0.0)
19	9.12E+01	04,06/01/09	(83790,	60365,	0.0)
20	9.11E+01	18,08/05/09	(83690,	60315,	0.0)
21	9.11E+01	04,11/12/09	(83740,	60315,	0.0)
22	9.11E+01	20,01/10/09	(83790,	60265,	0.0)
23	9.09E+01	12,07/07/09	(83690,	60315,	0.0)
24	9.08E+01	04,06/03/09	(83940,	60215,	0.0)
25	9.03E+01	03,07/03/09	(83840,	60365,	0.0)
26	8.94E+01	02,06/04/09	(83840,	60365,	0.0)
27	8.75E+01	04,12/01/09	(83790,	60365,	0.0)
28	8.72E+01	18,27/04/09	(83690,	60315,	0.0)
29	8.72E+01	04,30/11/09	(83740,	60315,	0.0)
30	8.62E+01	08,29/05/09	(83690,	60315,	0.0)
31	8.62E+01	02,22/03/09	(83890,	60265,	0.0)
32	8.59E+01	08,28/12/09	(83690,	60315,	0.0)
33	8.59E+01	01,03/10/09	(83840,	60365,	0.0)
34	8.55E+01	16,16/07/09	(83690,	60315,	0.0)
35	8.51E+01	02,13/12/09	(83790,	60365,	0.0)
36	8.51E+01	20,05/09/09	(83840,	60415,	0.0)
37	8.46E+01	05,02/11/09	(83840,	60365,	0.0)
38	8.41E+01	02,29/01/09	(83840,	60365,	0.0)
39	8.40E+01	24,16/04/09	(83940,	60315,	0.0)
40	8.40E+01	21,22/11/09	(83690,	60315,	0.0)
41	8.37E+01	23,24/11/09	(83890,	60415,	0.0)
42	8.28E+01	18,24/08/09	(83690,	60315,	0.0)
43	8.22E+01	06,10/10/09	(83690,	60315,	0.0)
44	8.20E+01	01,19/10/09	(83940,	60215,	0.0)
45	8.16E+01	02,06/03/09	(83940,	60215,	0.0)
46	8.16E+01	24,09/04/09	(83890,	60265,	0.0)
47	8.13E+01	24,24/04/09	(83940,	60215,	0.0)

48	8.12E+01	07,18/10/09	(83690,	60315,	0.0)
49	8.12E+01	04,03/10/09	(83740,	60315,	0.0)
50	8.11E+01	05,19/03/09	(83940,	60315,	0.0)
51	8.09E+01	07,23/12/09	(83690,	60315,	0.0)
52	8.07E+01	21,15/04/09	(83790,	60265,	0.0)
53	8.07E+01	10,28/05/09	(83690,	60315,	0.0)
54	8.04E+01	23,05/10/09	(83690,	60315,	0.0)
55	8.03E+01	01,28/05/09	(83890,	60365,	0.0)
56	7.99E+01	21,29/04/09	(83690,	60315,	0.0)
57	7.97E+01	05,29/03/09	(83890,	60365,	0.0)
58	7.97E+01	20,12/02/09	(83840,	60415,	0.0)
59	7.97E+01	23,27/05/09	(83890,	60265,	0.0)
60	7.95E+01	02,08/04/09	(83740,	60315,	0.0)
61	7.93E+01	04,25/05/09	(83690,	60315,	0.0)
62	7.91E+01	01,14/10/09	(83940,	60315,	0.0)
63	7.89E+01	23,18/05/09	(83890,	60365,	0.0)
64	7.87E+01	03,03/11/09	(83690,	60315,	0.0)
65	7.85E+01	03,18/03/09	(83890,	60415,	0.0)
66	7.85E+01	24,06/05/09	(83940,	60215,	0.0)
67	7.84E+01	04,25/10/09	(83890,	60365,	0.0)
68	7.83E+01	02,19/09/09	(83940,	60315,	0.0)
69	7.82E+01	02,19/12/09	(83940,	60315,	0.0)
70	7.81E+01	22,05/09/09	(83940,	60215,	0.0)
71	7.79E+01	05,19/05/09	(83890,	60365,	0.0)
72	7.76E+01	20,05/08/09	(83940,	60215,	0.0)
73	7.75E+01	02,15/11/09	(83890,	60215,	0.0)
74	7.72E+01	20,05/06/09	(83940,	60215,	0.0)
75	7.68E+01	23,17/03/09	(83790,	60265,	0.0)
76	7.68E+01	04,28/12/09	(83890,	60415,	0.0)
77	7.68E+01	20,12/08/09	(83940,	60315,	0.0)
78	7.67E+01	03,11/10/09	(83940,	60215,	0.0)
79	7.67E+01	04,19/12/09	(83840,	60365,	0.0)
80	7.63E+01	05,04/04/09	(83940,	60215,	0.0)
81	7.61E+01	03,22/11/09	(83790,	60315,	0.0)
82	7.61E+01	01,16/06/09	(83690,	60315,	0.0)
83	7.59E+01	08,14/09/09	(83690,	60315,	0.0)
84	7.56E+01	01,27/06/09	(83940,	60215,	0.0)
85	7.56E+01	03,05/10/09	(83940,	60215,	0.0)
86	7.56E+01	01,17/03/09	(83940,	60315,	0.0)
87	7.55E+01	24,20/11/09	(83840,	60465,	0.0)
88	7.54E+01	24,04/09/09	(83840,	60365,	0.0)
89	7.53E+01	23,29/04/09	(83690,	60315,	0.0)
90	7.53E+01	22,04/06/09	(83940,	60215,	0.0)
91	7.53E+01	24,15/09/09	(83890,	60365,	0.0)
92	7.52E+01	02,18/03/09	(83790,	60265,	0.0)
93	7.50E+01	14,28/12/09	(83690,	60315,	0.0)
94	7.48E+01	23,10/10/09	(83890,	60365,	0.0)
95	7.47E+01	17,03/09/09	(83690,	60315,	0.0)
96	7.44E+01	20,24/06/09	(83940,	60215,	0.0)
97	7.41E+01	19,17/07/09	(83690,	60315,	0.0)
98	7.40E+01	03,29/05/09	(83690,	60315,	0.0)
99	7.39E+01	02,15/04/09	(83940,	60215,	0.0)
100	7.38E+01	04,20/03/09	(83890,	60365,	0.0)

Appendix C

TANKS Output Files

TANKS 4.0.9d

Diesel Tanks

ID	MIX ID	PRIMARY	NAME	CAS	MONTH	TANK_TYPE	USER ID	CITY	STATE	COMPANY	DESC	MET CTYS	AMB_T	T_MIN	T_MAX	INSOL	P_A	S_LOSS	W_LOSS	RIM_LOSS lb	RIM_LOSS kg	WD_LOSS lb	WD_LOSS kg	DECKF_LOSS lb	DECKF_LOSS kg	DECKS_LO	MOLES	L_WT_FR	V_WT_FR	L_MO_FR	V_MO_FR	MOLWT	VP_MOLWT
19	1	TRUE	Distillate fuel oil no. 2		January	Internal Floatin	Diesel Tanl	Newcastle	New South Wales		Marstel Jul	San Francis	51.05	45.8	56.3	684.9859	14.7465	0	0	0.192905	0.0875	879.0668	398.7379	0.400286	0.181567	0	0	0	0	0	0	188	130
19	1	TRUE	Distillate fuel oil no. 2		February	Internal Floatin	Diesel Tanl	Newcastle	New South Wales		Marstel Jul	San Francis	54.35	48.7	60	945.7819	14.7465	0	0	0.205419	0.093177	879.0668	398.7379	0.426254	0.193345	0	0	0	0	0	0	188	130
19	1	TRUE	Distillate fuel oil no. 2		March	Internal Floatin	Diesel Tanl	Newcastle	New South Wales		Marstel Jul	San Francis	54.9	49	60.8	1345.859	14.7465	0	0	0.21083	0.095631	879.0668	398.7379	0.437482	0.198439	0	0	0	0	0	0	188	130
19	1	TRUE	Distillate fuel oil no. 2		April	Internal Floatin	Diesel Tanl	Newcastle	New South Wales		Marstel Jul	San Francis	55.95	49.8	62.1	1800.825	14.7465	0	0	0.218281	0.099011	879.0668	398.7379	0.452943	0.205451	0	0	0	0	0	0	188	130
19	1	TRUE	Distillate fuel oil no. 2		May	Internal Floatin	Diesel Tanl	Newcastle	New South Wales		Marstel Jul	San Francis	56.6	50.5	62.7	2126.978	14.7465	0	0	0.223309	0.101291	879.0668	398.7379	0.463375	0.210183	0	0	0	0	0	0	188	130
19	1	TRUE	Distillate fuel oil no. 2		June	Internal Floatin	Diesel Tanl	Newcastle	New South Wales		Marstel Jul	San Francis	58.35	52.6	64.1	2272.605	14.7465	0	0	0.23111	0.10483	879.0668	398.7379	0.479563	0.217526	0	0	0	0	0	0	188	130
19	1	TRUE	Distillate fuel oil no. 2		July	Internal Floatin	Diesel Tanl	Newcastle	New South Wales		Marstel Jul	San Francis	59.05	53.5	64.6	2329.396	14.7465	0	0	0.234446	0.106343	879.0668	398.7379	0.486485	0.220666	0	0	0	0	0	0	188	130
19	1	TRUE	Distillate fuel oil no. 2		August	Internal Floatin	Diesel Tanl	Newcastle	New South Wales		Marstel Jul	San Francis	60.1	54.6	65.6	2064.793	14.7465	0	0	0.235371	0.106763	879.0668	398.7379	0.488405	0.221537	0	0	0	0	0	0	188	130
19	1	TRUE	Distillate fuel oil no. 2		September	Internal Floatin	Diesel Tanl	Newcastle	New South Wales		Marstel Jul	San Francis	62.3	55.9	68.7	1705.961	14.7465	0	0	0.239591	0.108676	879.0668	398.7379	0.497161	0.225508	0	0	0	0	0	0	188	130
19	1	TRUE	Distillate fuel oil no. 2		October	Internal Floatin	Diesel Tanl	Newcastle	New South Wales		Marstel Jul	San Francis	61.95	55.2	68.7	1230.056	14.7465	0	0	0.232706	0.105554	879.0668	398.7379	0.482875	0.219028	0	0	0	0	0	0	188	130
19	1	TRUE	Distillate fuel oil no. 2		November	Internal Floatin	Diesel Tanl	Newcastle	New South Wales		Marstel Jul	San Francis	57.15	51.6	62.7	790.9541	14.7465	0	0	0.21253	0.096402	879.0668	398.7379	0.441009	0.200038	0	0	0	0	0	0	188	130
19	1	TRUE	Distillate fuel oil no. 2		December	Internal Floatin	Diesel Tanl	Newcastle	New South Wales		Marstel Jul	San Francis	51.7	47	56.4	625.3392	14.7465	0	0	0.194335	0.088149	879.0668	398.7379	0.403253	0.182912	0	0	0	0	0	0	188	130

ID	L_DENS	ALPHA	ALPHA_2	ALS_TEMP	MLS_TEMP	XLS_TEMP	BULK_T	A_VP	M_VP	X_VP	DIAMETEF	EFF_DIAM	HEIGHT_S	HEIGHT_F	HEIGHT_L	HEIGHT_A	VOLUME	Q_NET	TURNOVE	SHL_COLS	SHL_CONI	PT_COND	RF_COLSI	RF_COND	RF_TYPE	VP_RANG	T_RANGE	VT_RANG	RF_OUT	VS_OUT	VS_VOL	V_DENS	BV_RANG	K_E
19	7.1	-17	-35	TRUE	Distillate fuel	oil no. 3	February	Internal Flo	Diesel Tanl	Newcastle	New South Wales		Marstel Jul	San Francis	30.34125	13.38721	-17	-35	TRUE	Distillate fuel	oil no. 3	February	Internal Flo	Diesel Tanl	-17	-35	TRUE	Distillate fu	0	0	0	0	0	0
19	7.1	0.17	0.17	516.7597	513.6002	519.9191988	516.6442	0.005918	0	0	118.1	0	0	0	0	0	4570210	4341700	11.43	White/Whit	Gunite Lini	Good	White/Whit	Good		0	0	0	0	0	0	0	0	0
19	7.1	0.17	0.17	517.539	513.8134	521.264595	516.6442	0.006074	0	0	118.1	0	0	0	0	0	4570210	4341700	11.43	White/Whit	Gunite Lini	Good	White/Whit	Good		0	0	0	0	0	0	0	0	0
19	7.1	0.17	0.17	518.612	514.2551	522.9690218	516.6442	0.006288	0	0	118.1	0	0	0	0	0	4570210	4341700	11.43	White/Whit	Gunite Lini	Good	White/Whit	Good		0	0	0	0	0	0	0	0	0
19	7.1	0.17	0.17	519.3361	514.609	524.0631688	516.6442	0.006433	0	0	118.1	0	0	0	0	0	4570210	4341700	11.43	White/Whit	Gunite Lini	Good	White/Whit	Good		0	0	0	0	0	0	0	0	0
19	7.1	0.17	0.17	520.3016	515.5272	525.0760418	516.6442	0.006658	0	0	118.1	0	0	0	0	0	4570210	4341700	11.43	White/Whit	Gunite Lini	Good	White/Whit	Good		0	0	0	0	0	0	0	0	0
19	7.1	0.17	0.17	520.6859	515.9159	525.4558943	516.6442	0.006754	0	0	118.1	0	0	0	0	0	4570210	4341700	11.43	White/Whit	Gunite Lini	Good	White/Whit	Good		0	0	0	0	0	0	0	0	0
19	7.1	0.17	0.17	520.7926	516.3554	525.2296544	516.6442	0.006781	0	0	118.1	0	0	0	0	0	4570210	4341700	11.43	White/Whit	Gunite Lini	Good	White/Whit	Good		0	0	0	0	0	0	0	0	0
19	7.1	0.17	0.17	521.2786	516.9445	525.612732	516.6442	0.006902	0	0	118.1	0	0	0	0	0	4570210	4341700	11.43	White/Whit	Gunite Lini	Good	White/Whit	Good		0	0	0	0	0	0	0	0	0
19	7.1	0.17	0.17	520.4855	516.5917	524.3792646	516.6442	0.006704	0	0	118.1	0	0	0	0	0	4570210	4341700	11.43	White/Whit	Gunite Lini	Good	White/Whit	Good		0	0	0	0	0	0	0	0	0
19	7.1	0.17	0.17	517.7838	514.8445	520.7230201	516.6442	0.006123	0	0	118.1	0	0	0	0	0	4570210	4341700	11.43	White/Whit	Gunite Lini	Good	White/Whit	Good		0	0	0	0	0	0	0	0	0
19	7.1	0.17	0.17	515.1634	512.7272	517.5995175	516.6442	0.005599	0	0	118.1	0	0	0	0	0	4570210	4341700	11.43	White/Whit	Gunite Lini	Good	White/Whit	Good		0	0	0	0	0	0	0	0	0

ID	K_S	K_N	K_P	M_KR	M_P	M_KC	M_C	VENT_P	VENT_V	C_SLOPE	D_RADIUS	NC	FC	M_FF	SD	KD	N_FACT	TANK_CO	RIM_PRIM	RIM_SEC	M_KRA	M_KRB	FITTING	M_V	DECK_TYI	DECK_CO	DECK_SE	DECK_SE	COL_NO	COL_DIAM	SELF_SUF	UNDER	HEATED
19	0	0	0	1.6	9.42E-05		1	0.15	0	0	0	0	0	392.1	0	0	1.6		Mechanical	Shoe-mour	1.6	0.3	Typical		0	Welded	0		0	0	0	TRUE	FALSE	FALSE
19	0	0	0	1.6	0.0001		1	0.15	0	0	0	0	0	392.1	0	0	1.6		Mechanical	Shoe-mour	1.6	0.3	Typical		0	Welded	0		0	0	0	TRUE	FALSE	FALSE
19	0	0	0	1.6	0.000103		1	0.15	0	0	0	0	0	392.1	0	0	1.6		Mechanical	Shoe-mour	1.6	0.3	Typical		0	Welded	0		0	0	0	TRUE	FALSE	FALSE
19	0	0	0	1.6	0.000107		1	0.15	0	0	0	0	0	392.1	0	0	1.6		Mechanical	Shoe-mour	1.6	0.3	Typical		0	Welded	0		0	0	0	TRUE	FALSE	FALSE
19	0	0	0	1.6	0.000109		1	0.15	0	0	0	0	0	392.1	0	0	1.6		Mechanical	Shoe-mour	1.6	0.3	Typical		0	Welded	0		0	0	0	TRUE	FALSE	FALSE
19	0	0	0	1.6	0.000113		1	0.15	0	0	0	0	0	392.1	0	0	1.6		Mechanical	Shoe-mour	1.6	0.3	Typical		0	Welded	0		0	0	0	TRUE	FALSE	FALSE
19	0	0	0	1.6	0.000115		1	0.15	0	0	0	0	0	392.1	0	0	1.6		Mechanical	Shoe-mour	1.6	0.3	Typical		0	Welded	0		0	0	0	TRUE	FALSE	FALSE
19	0	0	0	1.6	0.000115		1	0.15	0	0	0	0	0	392.1	0	0	1.6		Mechanical	Shoe-mour	1.6	0.3	Typical		0	Welded	0		0	0	0	TRUE	FALSE	FALSE
19	0	0	0	1.6	0.000117		1	0.15	0	0	0	0	0	392.1	0	0	1.6		Mechanical	Shoe-mour	1.6	0.3	Typical		0	Welded	0		0	0	0	TRUE	FALSE	FALSE
19	0	0	0	1.6	0.000114		1	0.15	0	0	0	0	0	392.1	0	0	1.6		Mechanical	Shoe-mour	1.6	0.3	Typical		0	Welded	0		0	0	0	TRUE	FALSE	FALSE
19	0	0	0	1.6	0.000104		1	0.15	0	0	0	0	0	392.1	0	0	1.6		Mechanical	Shoe-mour	1.6	0.3	Typical		0	Welded	0		0	0	0	TRUE	FALSE	FALSE
19	0	0	0	1.6	9.49E-05		1	0.15	0	0	0	0	0	392.1	0	0	1.6		Mechanical	Shoe-mour	1.6	0.3	Typical		0	Welded	0		0	0	0	TRUE	FALSE	FALSE

BioDiesel Tanks

ID	MIX ID	PRIMARY	NAME	CAS	MONTH	TANK_TYPE	USER ID	CITY	STATE	COMPANY	DESC	MET CTYS	AMB_T	T_MIN	T_MAX	INSOL	P_A	S_LOSS	W_LOSS	RIM_LOSS lbm	RIM_LOSS kg	WD_LOSS lbm	WD_LOSS kg	DECKF_LOSS lbm	DECKF_LOSS kg	DECKS_LO	MOLES	L_WT_FR	V_WT_FR	L_MO_FR	V_MO_FR	MOLWT	VP_MOLWT
19	1	TRUE	Distillate fuel oil no. 2		January	Internal Floatin	BioDiesel T	Newcastle	New South Wales		Marstel Jul	San Francis	51.05	45.8	56.3	684.9859	14.7465	0	0	0.042795	0.019412	138.4901	62.81805	0.142208	0.064505	0	0	0	0	0	0	188	130
19	1	TRUE	Distillate fuel oil no. 2		February	Internal Floatin	BioDiesel T	Newcastle	New South Wales		Marstel Jul	San Francis	54.35	48.7	60	945.7819	14.7465	0	0	0.045571	0.020671	138.4901	62.81805	0.151434	0.068689	0	0	0	0	0	0	188	130
19	1	TRUE	Distillate fuel oil no. 2		March	Internal Floatin	BioDiesel T	Newcastle	New South Wales		Marstel Jul	San Francis	54.9	49	60.8	1345.859	14.7465	0	0	0.046772	0.021215	138.4901	62.81805	0.155423	0.070499	0	0	0	0	0	0	188	130
19	1	TRUE	Distillate fuel oil no. 2		April	Internal Floatin	BioDiesel T	Newcastle	New South Wales		Marstel Jul	San Francis	55.95	49.8	62.1	1800.825	14.7465	0	0	0.048425	0.021965	138.4901	62.81805	0.160915	0.07299	0	0	0	0	0	0	188	130
19	1	TRUE	Distillate fuel oil no. 2		May	Internal Floatin	BioDiesel T	Newcastle	New South Wales		Marstel Jul	San Francis	56.6	50.5	62.7	2126.978	14.7465	0	0	0.04954	0.022471	138.4901	62.81805	0.164622	0.074671	0	0	0	0	0	0	188	130
19	1	TRUE	Distillate fuel oil no. 2		June	Internal Floatin	BioDiesel T	Newcastle	New South Wales		Marstel Jul	San Francis	58.35	52.6	64.1	2272.605	14.7465	0	0	0.051271	0.023256	138.4901	62.81805	0.170373	0.07728	0	0	0	0	0	0	188	130
19	1	TRUE	Distillate fuel oil no. 2		July	Internal Floatin	BioDiesel T	Newcastle	New South Wales		Marstel Jul	San Francis	59.05	53.5	64.6	2329.396	14.7465	0	0	0.052011	0.023592	138.4901	62.81805	0.172832	0.078395	0	0	0	0	0	0	188	130
19	1	TRUE	Distillate fuel oil no. 2		August	Internal Floatin	BioDiesel T	Newcastle	New South Wales		Marstel Jul	San Francis	60.1	54.6	65.6	2064.793	14.7465	0	0	0.052216	0.023685	138.4901	62.81805	0.173514	0.078705	0	0	0	0	0	0	188	130
19	1	TRUE	Distillate fuel oil no. 2		September	Internal Floatin	BioDiesel T	Newcastle	New South Wales		Marstel Jul	San Francis	62.3	55.9	68.7	1705.961	14.7465	0	0	0.053152	0.024109	138.4901	62.81805	0.176624	0.080116	0	0	0	0	0	0	188	130
19	1	TRUE	Distillate fuel oil no. 2		October	Internal Floatin	BioDiesel T	Newcastle	New South Wales		Marstel Jul	San Francis	61.95	55.2	68.7	1230.056	14.7465	0	0	0.051625	0.023417	138.4901	62.81805	0.171549	0.077813	0	0	0	0	0	0	188	130
19	1	TRUE	Distillate fuel oil no. 2		November	Internal Floatin	BioDiesel T	Newcastle	New South Wales		Marstel Jul	San Francis	57.15	51.6	62.7	790.9541	14.7465	0	0	0.047149	0.021386	138.4901	62.81805	0.156676	0.071067	0	0	0	0	0	0	188	130
19	1	TRUE	Distillate fuel oil no. 2		December	Internal Floatin	BioDiesel T	Newcastle	New South Wales		Marstel Jul	San Francis	51.7	47	56.4	625.3392	14.7465	0	0	0.043112	0.019555	138.4901	62.81805	0.143262	0.064983	0	0	0	0	0	0	188	130

ID	L_DENS	ALPHA	ALPHA_2	ALS_TEMP	MLS_TEMP	XLS_TEMP	BULK_T	A_VP	M_VP	X_VP	DIAMETEF	EFF_DIAM	HEIGHT_S	HEIGHT_F	HEIGHT_L	HEIGHT_A	VOLUME	Q_NET	TURNOVE	SHL_COLS	SHL_CONI	PT_COND	RF_COLSI	RF_COND	RF_TYPE	VP_RANG	T_RANGE	VT_RANG	RF_OUT	VS_OUT	VS_VOL	V_DENS	BV_RANGE
19	7.1	0.17	0.17	514.9575	512.2523	517.6626027	516.6442	0.005557	0	0	26.2	0	0	0	0	0	159310	151742.8	11.43	White/Whit	Gunite Lini	Good	White/Whit	Good		0	0	0	0	0	0	0	0
19	7.1	0.17	0.17	516.7597	513.6002	519.9191988	516.6442	0.005918	0	0	26.2	0	0	0	0	0	159310	151742.8	11.43	White/Whit	Gunite Lini	Good	White/Whit	Good		0	0	0	0	0	0	0	0
19	7.1	0.17	0.17	517.539	513.8134	521.264595	516.6442	0.006074	0	0	26.2	0	0	0	0	0	159310	151742.8	11.43	White/Whit	Gunite Lini	Good	White/Whit	Good		0	0	0	0	0	0	0	0
19	7.1	0.17	0.17	518.612	514.2551	522.9690218	516.6442	0.006288	0	0	26.2	0	0	0	0	0	159310	151742.8	11.43	White/Whit	Gunite Lini	Good	White/Whit	Good		0	0	0	0	0	0	0	0
19	7.1	0.17	0.17	519.3361	514.609	524.0631688	516.6442	0.006433	0	0	26.2	0	0	0	0	0	159310	151742.8	11.43	White/Whit	Gunite Lini	Good	White/Whit	Good		0	0	0	0	0	0	0	0
19	7.1	0.17	0.17	520.3016	515.5272	525.0760418	516.6442	0.006658	0	0	26.2	0	0	0	0	0	159310	151742.8	11.43	White/Whit	Gunite Lini	Good	White/Whit	Good		0	0	0	0	0	0	0	0
19	7.1	0.17	0.17	520.6859	515.9159	525.4558943	516.6442	0.006754	0	0	26.2	0	0	0	0	0	159310	151742.8	11.43	White/Whit	Gunite Lini	Good	White/Whit	Good		0	0	0	0	0	0	0	0
19	7.1	0.17	0.17	520.7926	516.3554	525.2296544	516.6442	0.006781	0	0	26.2	0	0	0	0	0	159310	151742.8	11.43	White/Whit	Gunite Lini	Good	White/Whit	Good		0	0	0	0	0	0	0	0
19	7.1	0.17	0.17	521.2786	516.9445	525.612732	516.6442	0.006902	0	0	26.2	0	0	0	0	0	159310	151742.8	11.43	White/Whit	Gunite Lini	Good	White/Whit	Good		0	0	0	0	0	0	0	0
19	7.1	0.17	0.17	520.4855	516.5917	524.3792646	516.6442	0.006704	0	0	26.2	0	0	0	0	0	159310	151742.8	11.43	White/Whit	Gunite Lini	Good	White/Whit	Good		0	0	0	0	0	0	0	0
19	7.1	0.17	0.17	517.7838	514.8445	520.7230201	516.6442	0.006123	0	0	26.2	0	0	0	0	0	159310	151742.8	11.43	White/Whit	Gunite Lini	Good	White/Whit	Good		0	0	0	0	0	0	0	0
19	7.1	0.17	0.17	515.1634	512.7272	517.5995175	516.6442	0.005599	0	0	26.2	0	0	0	0	0	159310	151742.8	11.43	White/Whit	Gunite Lini	Good	White/Whit	Good		0	0	0	0	0	0	0	0

ID	K_E	K_S	K_N	K_P	M_KR	M_P	M_KC	M_C	VENT_P	VENT_V	C_SLOPE	D_RADIUS	NC	FC	M_FF	SD	KD	N_FACT	TANK_CO	RIM_PRIM	RIM_SEC	M_KRA	M_KRB	FITTING	M_V	DECK_TYI	DECK_CO	DECK_SE	DECK_SE	COL_NO	COL_DIAM	SELF_SUF	UNDER	HEATED
19	0	0	0	0	1.6	9.42349E-05		1	0.15	0	0	0	0	0	139.3	0	0	1.6		Mechanical	Shoe-mour	1.6	0.3	Typical		0	Welded	0		0	0	0	TRUE	FALSE	FALSE
19	0	0	0	0	1.6	0.000100348		1	0.15	0	0	0	0	0	139.3	0	0	1.6		Mechanical	Shoe-mour	1.6	0.3	Typical		0	Welded	0		0	0	0	TRUE	FALSE	FALSE
19	0	0	0	0	1.6	0.000102991		1	0.15	0	0	0	0	0	139.3	0	0	1.6		Mechanical	Shoe-mour	1.6	0.3	Typical		0	Welded	0		0	0	0	TRUE	FALSE	FALSE
19	0	0	0	0	1.6	0.000106631		1	0.15	0	0	0	0	0	139.3	0	0	1.6		Mechanical	Shoe-mour	1.6	0.3	Typical		0	Welded	0		0	0	0	TRUE	FALSE	FALSE
19	0	0	0	0	1.6	0.000109087		1	0.15	0	0	0	0	0	139.3	0	0	1.6		Mechanical	Shoe-mour	1.6	0.3	Typical		0	Welded	0		0	0	0	TRUE	FALSE	FALSE
19	0	0	0	0	1.6	0.000112898		1	0.15	0	0	0	0	0	139.3	0	0	1.6		Mechanical	Shoe-mour	1.6	0.3	Typical		0	Welded	0		0	0	0	TRUE	FALSE	FALSE
19	0	0	0	0	1.6	0.000114528		1	0.15	0	0	0	0	0	139.3	0	0	1.6		Mechanical	Shoe-mour	1.6	0.3	Typical		0	Welded	0		0	0	0	TRUE	FALSE	FALSE
19	0	0	0	0	1.6	0.00011498		1	0.15	0	0	0	0	0	139.3	0	0	1.6		Mechanical	Shoe-mour	1.6	0.3	Typical		0	Welded	0		0	0	0	TRUE	FALSE	FALSE
19	0	0	0	0	1.6	0.000117041		1	0.15	0	0	0	0	0	139.3	0	0	1.6		Mechanical	Shoe-mour	1.6	0.3	Typical		0	Welded	0		0	0	0	TRUE	FALSE	FALSE
19	0	0	0	0	1.6	0.000113678		1	0.15	0	0	0	0	0	139.3	0	0	1.6		Mechanical	Shoe-mour	1.6	0.3	Typical		0	Welded	0		0	0	0	TRUE	FALSE	FALSE
19	0	0	0	0	1.6	0.000103822		1	0.15	0	0	0	0	0	139.3	0	0	1.6		Mechanical	Shoe-mour	1.6	0.3	Typical		0	Welded	0		0	0	0	TRUE	FALSE	FALSE
19	0	0	0	0	1.6	9.49333E-05		1	0.15	0	0	0	0	0	139.3	0	0	1.6		Mechanical	Shoe-mour	1.6	0.3	Typical		0	Welded	0		0	0	0	TRUE	FALSE	FALSE

Appendix G

Noise and Vibration Impact Assessment

Appendix G Noise and Vibration Impact Assessment

Newcastle Ports Corporation
5 August 2011

Marstel Bulk Fuel Facility

Noise and Vibration Impact Assessment



Marstel Bulk Fuel Facility

Noise and Vibration Impact Assessment

Prepared for

Newcastle Ports Corporation

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Table of Contents

1.0 Introduction 1
1.1 Introduction 1
1.2 Site description 1
2.0 Existing Noise Environment 3
2.1 Surrounding receivers 3
2.2 Existing noise environment 3
3.0 Construction Noise and Vibration Criteria 5
3.1 Construction noise management levels 5
3.1.1 Construction noise management levels 7
3.2 Construction vibration criteria 8
3.3 Construction traffic noise on sub-arterial roads 8
4.0 Operational Noise and Vibration Criteria 9
4.1 Operational noise criteria 9
4.1.1 Protection of the Environment Operations Act 1997 – Section 139 9
4.1.2 Industrial Noise Policy 9
4.1.3 Environmental noise criteria 11
4.1.4 Other noise sensitive receivers 11
4.1.5 Sleep disturbance criteria 11
4.2 Operational vibration criteria 12
4.3 Road traffic noise criteria 12
4.3.1 Road traffic noise levels 12
5.0 Construction Noise Assessment 15
5.1 Construction work hours 15
5.2 Equipment 15
5.2.1 Excavator 15
5.2.2 Trucks 15
5.2.3 Diesel generator and welders 16
5.3 Noise modelling methodology 16
5.3.1 Modelling assumptions 16
5.4 Predicted construction noise levels 17
5.4.1 Representative assessment receivers 17
5.5 Cumulative noise impacts of concurrent construction activities 17
6.0 Operational Acoustic Assessment 19
6.1 Equipment 19
6.1.1 Fuel Pumps: Flame Proof 3 Phase Induction Motor 19
6.1.2 Ship/Tanker Auxiliary Power Unit and Newcastle Tug Boats 19
6.1.3 Haulage Trucks and Forklift 19
6.2 Methodology 20
6.2.1 General modelling assumptions 20
6.2.2 Meteorological conditions modelled 20
6.2.3 Modelled operational scenarios 21
6.3 Predicted operational noise levels 21
6.3.1 Representative assessment receivers 21
6.4 Sleep disturbance 22
6.5 Cumulative noise impacts of concurrent operational activities 23
6.6 Road traffic noise assessment 24
7.0 Noise and Vibration Management and Mitigation Strategies 27
7.1 Construction hours 27
7.2 Standard mitigation measures 27
7.3 Respite periods 27
7.4 Local road traffic – heavy vehicles noise mitigation 28
7.5 Equipment selection and maintenance 28
8.0 Conclusion 29

Appendix A
Acoustic Terminology A

Appendix B
Operational and Construction Noise Contour Maps B

List of Tables

Table 1	Representative sensitive receiver locations	3
Table 2	Measured noise levels (Spectrum Acoustics, 2008)	4
Table 3	Noise management levels at residences using quantitative assessment	6
Table 4	Construction noise management levels – Residential receivers	7
Table 5	Construction noise management levels – Sensitive land uses other than residential	7
Table 6	Recommended $L_{Aeq,\ 15\ minute}$ intrusive noise criteria levels from industrial noise sources	10
Table 7	Recommended $L_{Aeq,\ period}$ amenity noise criteria levels from industrial noise sources	10
Table 8	Final environmental noise criteria	11
Table 9	Non residential receiver noise criteria	11
Table 10	Night-time sleep disturbance criteria	12
Table 11	Road traffic noise criteria – Sub-arterial roads	12
Table 12	OEH's ICNG standard hours and out of hours work periods	15
Table 13	Pump motor with attenuation sound power level	16
Table 14	Predicted construction noise levels – Residential receivers	17
Table 15	Pump motor without attenuation sound power level	19
Table 16	Berth 4 activities and sound power levels	19
Table 17	Assumed noise levels for haulage trucks and forklift	20
Table 18	Noise contribution at representative receiver locations during night-time operational conditions – Amenity criteria	21
Table 19	Noise contribution at representative receiver locations during night-time operational conditions – Intrusiveness criteria	22
Table 20	$L_{A1\ (1\ minute)}$ Noise contribution at representative sensitive receiver locations during night time operational conditions	23
Table 21	Predicted noise levels due to concurrent industrial noise emissions and operations of the Bulk Fuel Facility	24
Table 22	Potential traffic generation	24
Table 23	RTA Traffic count for Industrial Drive, Mayfield (RTA, 2005)	25
Table 24	Summary of traffic flow increase	25

1.0 Introduction

1.1 Introduction

AECOM Australia Pty Ltd (AECOM) has been engaged by Newcastle Ports Corporation (NPC) to undertake an assessment of the potential noise and vibration impacts of the new bulk fuel facility to be operated by Marstel Pty Ltd (Marstel Bulk Fuel Facility) at the Port of Newcastle, NSW.

The proposed terminal facility will be used for the receiving, blending, storage and distribution of fuels and biofuels.

The nearest residential areas to the site are located to the south-west of the project site at Mayfield, with the closest receptors in Crebert Street, approximately 900 m from the proposed terminal site. To the south east there are residential receivers located in Carrington, approximately 2 km away.

The purpose of the assessment is to assess potential construction and operational, environmental noise and vibration impacts that this development may generate as the site is developed beyond the year 2016, and recommend mitigation measures, if necessary.

The environmental noise emissions impact assessment has been carried out in accordance with the NSW Office of Environment and Heritage's (OEH) *NSW Industrial Noise Policy* (INP, 2000), the *Interim construction noise guideline* (ICNG, 2009) and the *NSW Road Noise Policy* (RNP, 2011) and supersedes the previous site assessment:

- *"Noise Impact Assessment, Marstel Terminals Newcastle, Mayfield (BHP) Site, NSW",* 2008 by Spectrum Acoustics;

In addition reference has been made to the Mayfield whole of site assessment, undertaken by Wilkinson Murray in the report:

- *"Mayfield Site Port-Related Activities Concept Plan EA"*, revision F, 2009 by Wilkinson Murray.

This report is technical in content. A glossary of acoustic terminology can be found in Appendix A.

1.2 Site description

The Marstel Bulk Fuel Facility is to be located on the former BHP steelworks site in Mayfield North, directly adjacent to the Hunter River.

The construction of a terminal facility that will be used for the storage and blending of high quality fuels will include three primary storage tanks, in addition to a receiving terminal for ships at Berth 4 with pipe work linking the two sites.

During operation, haulage ships will dock at Berth 4 and pump fuel into storage tanks to be blended and held on site. Haulage trucks will receive the blended fuels and remove it through an access road leading to the intersection of Industrial Drive and Ingall Street.

The site location, noise monitoring locations and key sensitive receivers are shown in Figure 1.

Figure 1 Site location



2.0 Existing Noise Environment

2.1 Surrounding receivers

The locations of the proposed development site and nearby sensitive receivers are shown in Figure 1. The representative receiver locations and the associated receiver areas for assessment purposes, along with the land use classification (as defined in the INP) of each receiver are presented in Table 1.

Table 1 Representative sensitive receiver locations

Receiver number	Address	Land use classification	Associated receiver area
R1	1 Arthur St, Mayfield	Residence - Urban	Mayfield
R2	2 Crebert St, Mayfield	Residence - Urban	Mayfield
R3	2 McNeil Close, Mayfield	Residence - Urban	Mayfield
R4	21 Crebert St, Mayfield	Residence - Urban	Mayfield
R5	32 Elizabeth St, Carrington	Residence - Urban	Carrington
R6	40 Industrial Drive, Mayfield	Commercial	Mayfield
R7	52 Arthur St, Mayfield	Residence - Urban	Mayfield
R8	62 Arthur St, Mayfield	Residence - Urban	Mayfield
R9	Mayfield East Public School	School	Mayfield
R10	Onesteel Site -Lot 224 Steelworks Rd, Mayfield	Industrial	-

2.2 Existing noise environment

In order to establish the existing noise environment adjacent to the project area, ambient noise monitoring results presented in two noise assessments of the project area have been reviewed. The two assessments are as follows:

- *"Noise Impact Assessment, Marstel Terminals Newcastle, Mayfield (BHP) Site, NSW",* 2008 by Spectrum Acoustics;
- *"Mayfield Site Port-Related Activities Concept Plan EA"*, Revision F, 2009 by Wilkinson Murray.

For this assessment the more conservative criteria presented in the Spectrum Acoustics 2008 report has been selected to assess noise emissions from the construction and operations of the bulk fuel facility.

Spectrum Acoustics included in this report the results of measurements undertaken by Heggies Australia at three locations which were presented in the published environmental assessment for the proposed third coal loader on Kooragang Island (Newcastle Coal Infrastructure Group (NCIG) Coal Export Terminal, Resources Strategies, 2006) where the existing background (L_{A90}) and L_{Aeq} noise levels were measured in accordance with procedures in the INP.

The existing L_{Aeq} noise level from industrial noise also needs to be taken into account when setting noise goals and determining an amenity criterion for a project. The existing L_{Aeq} noise levels in the residential areas around the project study area were presented in the Spectrum Acoustics 2008 report and the results of these measurements are shown below in Table 2.

Table 2 Measured noise levels (Spectrum Acoustics, 2008)

Location	Noise level descriptor	Measured noise level		
		Day 7am – 6pm	Evening 6pm – 10pm	Night 10pm – 7am
Mayfield	L_{A90}	46	47	43
	L_{Aeq}	63	59	56
	Existing industrial noise L_{Aeq}	54	47	45
Carrington	L_{A90}	42	41	37
	L_{Aeq}	62	67	57
	Existing industrial noise L_{Aeq}	46	45	42

3.0 Construction Noise and Vibration Criteria

3.1 Construction noise management levels

In July 2009 the NSW Department of Environment, Climate Change and Water (DECCW) (now Office of Environment and Heritage (EOH)) published the *Interim Construction Noise Guidelines (ICNG, 2009)* for use in construction noise assessment. This document replaces the previous publication the *Environmental Noise Control Manual (ENCM)* and is used as the basis for establishing construction noise criteria for the proposed development.

Under the ICNG a construction noise management plan is required to be compiled by the Contractor, prior to construction commencing. Noise level objectives must be set for the daytime evening and night-time periods, and must be complied with where reasonably practicable. Work that is proposed outside of standard working hours, as defined in the *ICNG*, generally requires strong justification.

The noise management plan should detail the '*best practice*' construction methods to be used, presenting a reasonable and feasible approach. The plan should identify the extent of the residential area affected and assess the impact on residents. The plan should detail any community relation programs that are planned e.g. prior notification for particularly noisy activities, letter box drop regarding out of hours construction work to be undertaken and a 24 hour contact phone number for residents to call should they have any complaints or questions.

The *ICNG* defines what is considered to be feasible and reasonable as follows:

> *"Feasible*
>
> > *A work practice or abatement measure is feasible if it is capable of being put into practice or of being engineered and is practical to build given project constraints such as safety and maintenance requirements.*
>
> *Reasonable*
>
> > *Selecting reasonable measures from those that are feasible involves making a judgment to determine whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the measure."*

The *ICNG* recommends that a quantitative assessment is carried out for all *'major construction projects that are typically subject to the EIA process'*. A quantitative assessment, based on a likely '*worst case*' construction scenario, has been carried out for the Marstel Bulk Fuel Facility.

Predicted noise levels at nearby sensitive receivers (residential, commercial and industrial premises) are compared to the levels provided in Section 4 of the *ICNG*. Where an exceedance of the criteria is predicted the *ICNG* advises that the proponent should apply all feasible and reasonable work practises to minimise the noise impact.

Construction noise management levels (NMLs) for residential receivers are set using the information in Table 3.

Table 3 Noise management levels at residences using quantitative assessment

Time of Day	Management Level $L_{Aeq\ (15min)}$ [1]	How to Apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	- The noise affected level represents the point above which there may be some community reaction to noise. - Where the predicted or measured $L_{Aeq\ (15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. - The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	- The highly noise affected level represents the point above which there may be strong community reaction to noise. - Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: • times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences. - If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	- A strong justification would typically be required for works outside the recommended standard hours. - The proponent should apply all feasible and reasonable work practices to meet the noise affected level. - Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. - For guidance on negotiating agreements see section 7.2.2 of the ICNG.

Notes:

1. Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

3.1.1 Construction noise management levels

It is assumed that the construction activities will take place predominantly during recommended standard working hours (7.00 am – 6.00 pm Monday to Friday and 8.00 am – 1.00 pm Saturday). However, oversized loads and emergency work may need to be conducted outside recommended standard working hours.

Construction noise management levels for the nearest sensitive residential receivers areas are shown in Table 4.

Table 4 Construction noise management levels – Residential receivers

Residential receivers area	Daytime RBL L_{A90} dB(A)	Daytime noise management levels L_{Aeq} dB(A)	Evening RBL L_{A90} dB(A)	Evening noise management levels L_{Aeq} dB(A)	Night-time RBL L_{A90} dB(A)	Night-time noise management limit L_{Aeq} dB(A)
Mayfield	46	61	46[1]	51	43	48
Carrington	42	57	41	46	37	42

Notes:

1. The INP application notes recommends that when higher background noise levels (RBL) occur in the evening assessment period, that the criteria are generally set to the lower daytime criteria in accordance with community expectations.
2. RBL values have been adopted from "*Noise Impact Assessment, Marstel Terminals Newcastle, Mayfield (BHP) Site, NSW*", 2008 by Spectrum Acoustics.

Noise management levels for other sensitive land uses around Mayfield, such as schools, places of worship are shown in Table 5. However, it is noted that there are no sensitive receivers outside of residences in close proximity to the proposed bulk storage site.

Table 5 Construction noise management levels – Sensitive land uses other than residential

Land Use	Noise management level, $L_{Aeq\ (15\ min)}$ (applies when premises are in use)
Classrooms at schools and other educational institutions	Internal noise level 45 dB(A)
Places of worship	Internal noise level 45 dB(A)
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	External noise level 65 dB(A)
Passive recreation areas(characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External noise level 60 dB(A)
Community centres	Depends on the intended use of the centre. Refer to the recommended 'maximum' internal levels in AS2107 for specific uses.

Criteria for industrial and commercial premises (e.g. general retail), are shown below:

- Industrial premises: external $L_{Aeq\ (15min)}$ 75 dB(A), and
- Offices, retail outlets: external $L_{Aeq\ (15min)}$ 70 dB(A).

3.2 Construction vibration criteria

Unlike the criteria applicable to noise emissions, vibration criteria are the same for both the construction and operational phases of this project. OEH's '*Assessing Vibration: a technical guideline*', (DECCW, 2006) has been designed to be used in evaluating and assessing the effects on amenity of vibration emissions from industry, transportation and machinery. The guideline is used in assessments of vibration impacts caused by the construction and operation of new developments.

Vibration criteria are set primarily according to whether the particular activities of interest are continuous in nature or intermittent, whether they occur during the daytime or night-time and the type of receiver to be assessed e.g. commercial or residential.

The effects of vibration in buildings can be divided into three main categories:

- Those in which the occupants or users of the building are inconvenienced or possibly disturbed, i.e. human disturbance or discomfort;
- Those in which the integrity of the building or the structure itself may be prejudiced; and
- Those where the building contents may be affected.

Therefore, vibration levels at sensitive receiver locations must be controlled so as to prevent discomfort and regenerated noise, and in some extreme cases, structural damage.

For the proposed Marstel Bulk Fuel Facility, the nearest residential receivers (vibration sensitive) are located more than 900m from the proposed development site. The existing nearby industrial developments are located approximately 50 m from the proposed bulk fuel storage site. This facility is neither noise nor vibration sensitive. At such distances, the risk of discomfort, regenerated noise and structural damage impacting receivers is extremely low and needs not to be considered further.

Vibration levels on residential receivers due to additional traffic generated by the proposed development during the construction phase are considered insignificant. This is due to the small number of additional heavy vehicles forecast during the construction phase of the project, refer to Section 5.2 for predicted construction traffic numbers. Therefore, from a vibration perspective, the issue of impacts caused by the construction of the Marstel Bulk Fuel Facility need not be considered further.

3.3 Construction traffic noise on sub-arterial roads

OEH's Road Noise Policy (RNP, 2011) guideline is appropriate for assessing construction traffic noise associated with the bulk fuel facility. The RNP guidelines are applicable for traffic movements generated during the construction phase of the bulk fuel facility project. The application of the road noise criteria is further explained in Section 4.3.

No major earthworks are anticipated in the construction of the facility. Daily truck movements are assumed to be low (i.e. <40 per day) as a result of construction works. As a result, it is expected that the increase in traffic numbers as a result of construction works for the Marstel Bulk Fuel Facility would have minimal effect on nearby roads.

4.0 Operational Noise and Vibration Criteria

4.1 Operational noise criteria

4.1.1 Protection of the Environment Operations Act 1997 – Section 139

The main acoustic requirement of *Protection of the Environment Operations Act 1997* (PoEOA) is to ensure that "a noise is not offensive". The definition for an offensive noise is included below.

***Offensive noise** is:*

(d) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances:

(i) is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or

(ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or

(e) that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances, prescribed by the regulations.

To determine if a noise source is offensive, a primary consideration is to determine whether the noise source is intrusive. The OEH provides guidelines for external noise emissions from developments in its *Industrial Noise Policy*. The INP recommends a method which can be used to ascertain the intrusiveness of noise emissions.

OEH states that the relationship between the statutory definition of offensive noise and intrusive noise is that intrusive noise can represent offensive noise, but whether this is always true can depend on the source of the noise, noise characteristics and cumulative noise levels. Therefore to avoid the emission of an offensive noise, noise emissions should not be intrusive as defined by the OEH in the following manner:

"A noise source is generally considered to be intrusive if noise from the source, when measured over a 15 minute period, exceeds the background noise by more than 5 dB(A).

Any noise generated within the Marstel Bulk Fuel Facility site boundary, including noise from plant, truck movements and mechanical services or associated with site buildings would be assessed in accordance with the INP. This means the assessment procedure for industrial noise sources has two components, which are:

- Controlling ***intrusive noise*** impacts in the short term for residences; and
- Maintaining ***noise level amenity*** for particular land uses for residences and other land uses.

4.1.2 Industrial Noise Policy

4.1.2.1 Intrusive noise impacts

The INP states that the noise from any single source should not intrude greatly above the prevailing background noise level. Industrial noises are generally considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (L_{Aeq}), measured over a 15 minute period, does not exceed the background noise level measured in the absence of the source by more than 5 dB(A). This is termed the *Intrusiveness Criterion*. The *Rating Background Level* (RBL) is the background noise level to be used for assessment purposes and is determined by the methods given in Section 3.1 of the INP. Adjustments are to be applied to the level of noise produced if the noise at the receiver contains potentially annoying characteristics such as tonality or impulsiveness.

Table 6 Recommended $L_{Aeq, 15\ minute}$ intrusive noise criteria levels from industrial noise sources

Receiver area	Time of day	RBL ($L_{A90, 15\ minute}$)	Intrusive criterion RBL + 5, dB(A)
Mayfield	Day	46	51
	Evening	47	52
	Night	43	48
Carrington	Day	42	47
	Evening	41	46
	Night	37	42

4.1.2.2 Protecting noise amenity

To limit continuing increases in noise levels, the maximum ambient noise level resulting from industrial noise sources should not normally exceed the acceptable noise levels specified in *Table 2.1* of the INP. That is, the background noise level should not exceed the level appropriate for the particular locality and land use. This is termed the Amenity criterion.

For a residential receiver in an urban area, the amenity criteria are shown in Table 7.

Table 7 Recommended $L_{Aeq, period}$ amenity noise criteria levels from industrial noise sources

Type of receiver	Indicative noise amenity area	Time of day	Recommended L_{Aeq} noise level dB(A)	
			Acceptable	Recommended maximum
Residence	Urban	Day	60	65
		Evening	50	55
		Night	45	50

The INP application notes state:

Where the ambient noise levels are below the Acceptable Noise Level (ANL), then ideally the measurement of the existing level of noise should include only noise from industrial sources. In these situations, however, it may be acceptable to include noise from other sources (for example, roads, and neighbourhood). The reasons for this are that:

- *including noise from other sources typically results in assessing the worst case for impacts on amenity; and*
- *strictly excluding noise from sources other than industry can be difficult and costly and may not be necessary if the development meets the criteria.*

Ambient levels at all noise logging locations include some contribution from existing traffic, but are in some instances are below the ANL. As it was possible to determine the contribution from existing industrial sources, the modification factors in Table 2.2 in the INP has been applied when determining the final environmental noise criteria. The adjusted amenity criterion for the residential receivers are as shown in Table 8.

Furthermore, the application notes go on to state:

Where the predicted amenity noise level is lower than the intrusive level for the proposed development, the proponent needs to ensure that both levels will be satisfied. In this situation, noise limits specified in the licence conditions will include both the intrusive and amenity noise levels predicted to be achieved by the proposal to ensure that the community is protected from intrusive noise impacts at all times.

4.1.3 Environmental noise criteria

A summary of the environmental noise criteria for the Marstel Bulk Fuel Facility is given in Table 8.

Table 8 Final environmental noise criteria

Receiver area	Period	RBL ($L_{A90, 15\ minute}$)	Intrusive criterion RBL + 5, dB(A)	Ambient ($L_{Aeq, period}$)	Industrial contribution, ($L_{Aeq\ 15\ minute}$ dB(A)	Amenity criterion[2]
Mayfield	Day	46	51	63	54	59
	Evening	47[1]	52	59	47	47
	Night	43	48	56	45	37
Carrington	Day	42	47	62	46	60
	Evening	41	46	67	45	48
	Night	37	42	57	42	42

Notes:

1. The OEH's INP application notes recommends that when higher background noise levels (RBL) occur in the evening assessment period, that the criteria are generally set to the lower daytime criteria in accordance with community expectations.
2. The amenity criterion has been based on Mayfield and Carrington receivers being classified as 'urban' receivers. This results in recommended amenity noise criterion of 60 dB(A) during the daytime, 50 dB(A) during the evening and 45 dB(A) during the night. The criterion has then been modified in accordance with the industrial contribution adjustment in Table 2.2 of the OEH INP.

4.1.4 Other noise sensitive receivers

The INP specifies the following noise criteria for non residential land uses as detailed in Table 9.

Table 9 Non residential receiver noise criteria

Type of receiver	Indicative noise amenity area	Time of day	Recommended L_{Aeq} noise level dB(A)	
			Acceptable	Recommended maximum
School classroom - Internal	Noisiest 1-hour period when in use	When in use	35[1]	40[1]
Commercial Premises	All	When in use	65	70
Industrial Premises	All	When in use	70	75

Note:

1. In the OEH INP the school classroom criteria is an internal noise level, with an acceptable noise level of 35 dB(A) and a recommended maximum of 40 dB(A). A 10 dB reduction has been assumed between external and internal noise levels based upon a window being open for adequate natural ventilation.

4.1.5 Sleep disturbance criteria

OEH's INP has been updated with application notes which discuss sleep disturbance and its objective assessment.

To minimise the risk of sleep disturbance as a result of industrial type operations during the night-time period, the OEH's INP application notes recommends that, the $L_{A1(1\ minute)}$ noise level outside a bedroom window should not exceed the L_{A90} background noise level by more than 15 dB(A) during the night-time period (10.00 pm to 7.00 am). OEH considers it is appropriate to use this metric as a screening criterion to assess the likelihood of sleep disturbance. If this screening criterion is found to be exceeded then a more detailed analysis must be

undertaken and include the extent that the maximum noise level exceeds the background noise level and the number of times this is likely to happen during the night-time period.

Based on the measured background noise levels during the night, the sleep disturbance criteria for the nearest noise sensitive residential receivers are presented in Table 10.

Table 10 Night-time sleep disturbance criteria

Location	Measured RBL $L_{A90,\ 15\ mins}$ dB(A)	Sleep disturbance screening criterion $L_{A1\ (1\ minute)}$ dB(A)
Mayfield	43	58
Carrington	37	52

4.2 Operational vibration criteria

Vibration due to activities during the operation of the facility has not been considered in this assessment. Refer to Section 3.2 for further explanation to the removal of operational vibration from this assessment.

4.3 Road traffic noise criteria

OEH's Road Noise Policy (RNP) has to be used to assess the noise arising from traffic generated by the proposed development. The RNP guidelines are applicable for traffic movements generated during the construction phase of the project as well as additional traffic generated during the operational phase.

4.3.1 Road traffic noise levels

As discussed in Section 3.3, access to the site will be via Industrial Drive. This road would be classified as sub-arterial roads. Table 11 presents the road traffic noise criteria from the OEH RNP. The external noise criteria are applied 1 m from the external facade of the affected building.

Table 11 Road traffic noise criteria – Sub-arterial roads

Period	Parameter	Criterion
Sub-arterial roads		
Day (7:00 am – 10:00 pm)	$L_{Aeq\ (15hr)}$	60 dB(A)
Night (10:00 pm – 7:00 am)	$L_{Aeq\ (9hr)}$	55 dB(A)

Note that where the criteria have already been exceeded the OEH recommends that:

"Where existing traffic noise levels are above the noise assessment criteria, the primary objective is to reduce these through feasible and reasonable measures to meet the assessment criteria. A secondary objective is to protect against excessive decreases in amenity as the result of the project by applying the relative increase criteria.

In assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.

...

For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'."

It should be noted that the existing ambient noise levels presented in Table 2 exceed the recommended criteria in Table 11.

The proposed access route will generate less than 40 vehicle movements/day during working hours as part of the operation activities associated with the bulk fuel facility. It is considered unlikely that the proposed vehicle movements associated with the site compound would exceed the applicable noise criteria on Industrial Drive. As

such, no further consideration has been made within this assessment for construction road traffic noise. A traffic noise assessment has been presented in Section 6.6 for the proposed operations of the bulk fuel facility.

Nevertheless, in order to minimise the potential risk to exceed the noise criteria at residential receivers on sub-arterial roads, the following measures are recommended to be incorporated.

- Vehicle movements (including delivery vehicles) to be restricted to the standard construction hours for construction activities;
- Delivery vehicles to have mufflers and any other noise control equipment maintained in good working order;
- Drivers are to avoid heavy acceleration and braking as far as is practicable; and
- Routes are to be selected so as to minimise the use of reversing alarms.

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5.0 Construction Noise Assessment

5.1 Construction work hours

Construction works are proposed to take place over a period of 14 months. The construction works are proposed to include the following activities:

- Excavation of areas for tank foundations (to a maximum of 0.6 m below the existing cap surface);
- Construction of tank foundations and reinforced concrete bund walls;
- Preparation of the bund floor (excavation, backfilling with crushed rock, installation of liner, additional backfilling with crushed rock and priming/sealing);
- Installation and diversion of services and infrastructure, including stormwater drainage lines;
- Relocation of the tanks to site and the fabrication of related piping and pump equipment;
- Construction of a pipeline on existing supports to transfer materials between the berth and the storage facility; and
- Construction vehicle movements.

Much of the material would be prefabricated wherever possible, particularly fuel facility components, thereby minimising the on-site construction activities.

Impacts of construction noise and vibration will have to be further detailed when the selection of a contractor is finalised and the construction program and associated equipment has been identified. This construction noise assessment is to be undertaken in accordance with the noise criteria presented in Section 3.0 of this report, alongside the construction noise and vibration management plan (CNVMP) that is required to be compiled by the Contractor prior to construction commencing.

It is recommended that the construction works are scheduled to occur during the ICNG standard construction hours of Monday to Friday – 7:00 am to 6:00 pm and Saturday – 8:00 am to 1:00 pm. The exception to this will be during emergency construction activities task, or potentially when a task is near completion close to 6:00 pm it may extend beyond the limit of the standard construction hours so that the overall construction works can be carried out in minimal time. The intent of this will be to shorten the overall length of the noise exposure to nearby receiver locations. The OEH's ICNG standard hours and out of hours work periods are defined in Table 12.

Table 12 OEH's ICNG standard hours and out of hours work periods

Work period	Time period[1]		
	Monday – Friday	Saturday	Sunday or Public Holiday
Standard Hours	7 am – 6 pm	8 am – 1 pm	-
Out of Hours Works	6 pm – 7 am	1 pm – 8 am	8 am – 8 am

5.2 Equipment

5.2.1 Excavator

In the excavation of footing for storage tanks etc, an excavator or front end loader is expected to be operational on site. To provide a conservative noise model, a large (Liebherr 994) excavator has been considered to be in operation.

5.2.2 Trucks

Truck movements would take place throughout each day to provide resources or removal of spoil if/when required. Truck movements have assumed that two truck movements per hour are required along the access road.

5.2.3 Diesel generator and welders

A total of three diesel generator and three diesel welding machines have been considered to be running concurrently.

Table 15 below provide the noise spectrum for the above mentioned plant and equipment anticipated for construction noise equipment on site.

Table 13 Pump motor with attenuation sound power level

Description	Octave band sound power noise levels, dB								
	O/A dB(A)	63	125	250	500	1000	2000	4000	8000
Liebherr 994 Excavator	**115**	116	117	110	113	111	106	101	-
Truck	**96**[1]	92	98	96	94	91	88	84	78
Diesel Welding Machines (Classic 300D)	**94**	73	72	72	96	86	79	75	72
Diesel Generators	**102**	103	100	104	98	97	93	84	75

Notes:

1. Noise level based upon measurements undertaken by AECOM at White Bay, NSW 24 June 2011

5.3 Noise modelling methodology

Noise levels due to the construction activities shown in Section 5.2 have been predicted at nearby noise sensitive receivers using SoundPLAN 7.0 (industry standard) noise modelling software.

The CONCAWE method was originally developed for predicting the long-distance propagation of noise from petrochemical complexes. It is especially suited to predicting noise propagation over large distances because it accounts for a range of atmospheric conditions that can significantly influence the propagation of noise over large distances.

Noting that the closest receptors in the vicinity of the proposed Marstel Bulk Fuel Facility are at least 500 m from the site, the CONCAWE environmental noise prediction method is an appropriate method for predicting the noise propagation.

The modelling includes:

- Ground topography;
- Buildings and structures;
- All sources behave as point, or moving point sources;
- All sources are ‘on’ during any 15 minute period to simulate a worst case;
- Ground Absorption (set at hard ground for the Hunter River and 60% elsewhere); and
- Representative construction or operational noise sources as required.

It can be expected that there may be differences between predicted and measured noise levels due to variations in instantaneous operating conditions, plant in operation during the measurement and also the location of the plant equipment.

5.3.1 Modelling assumptions

The following assumptions have been made in modelling all construction noise scenarios:

- For all scenarios all equipment will be operating at the same time, which is unlikely, and is a conservative assumption; and
- Neutral atmospheric conditions i.e. relatively calm, no temperature inversion.

5.4 Predicted construction noise levels

5.4.1 Representative assessment receivers

The noise from the construction of the Marstel Bulk Fuel Facility has been predicted at all of the nearest receivers. Predicted noise levels at representative receivers for the proposed construction activities associated with the bulk fuel facility are provided in Table 14. Noise contour maps are provided in Appendix B.

Table 14 Predicted construction noise levels – Residential receivers

Receiver[1]	$L_{Aeq(15min)}$ Noise level (external) (dB(A))						
	Predicted (external)[2]	Standard hours		OOH (evening)		OOH (Saturday)	
		Criteria	Exceedance	Criteria	Exceedance	Criteria	Exceedance
R1	31	61	-	51	-	51	-
R2	35	61	-	51	-	51	-
R3	32	61	-	51	-	51	-
R4	35	61	-	51	-	51	-
R5	26	57	-	46	-	47	-
R6	34	70	-	70	-	70	-
R7	34	61	-	51	-	51	-
R8	34	61	-	51	-	51	-
R9	31	55[3]	-	N/A[4]	-	N/A[4]	-
R10	59	75	-	75	-	75	-

Notes:

1. All the representative sensitive receiver locations are presented in Table 1.
2. Predicted noise levels have been assessed against neutral meteorological conditions.
3. In the OEH ICNG school classroom criteria is an internal noise level, with a recommended internal noise level of 45 dB(A). A 10 dB reduction has been assumed between external and internal noise levels based upon a window being open for adequate natural ventilation.
4. Schools are required to be assessed during school hours only.

Predicted noise levels at the nearest affected receivers are presented in Table 14. The construction activities are predicted to comply with the recommended construction NMLs at all nearby sensitive receiver locations.

5.5 Cumulative noise impacts of concurrent construction activities

There are no other proposed constructions activities at nearby sites that are currently known of. As a result, there will not be any additional increase in the predicted noise impacts from construction activities on nearby noise sensitive receiver locations.

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6.0 Operational Acoustic Assessment

6.1 Equipment

6.1.1 Fuel Pumps: Flame Proof 3 Phase Induction Motor

The following assessment is based upon the nine motorised pumps to be installed on the eastern boundary of the site. The location of the pumps has been based upon the location shown on Drawing Figure 3 – Proposed Site Layout, Dated 6 June 2011 drawn by AECOM and presented in *Bulk Fuel Storage Facility Environmental Assessment , AECOM Aug 2011*. Sound power spectrum levels for the pump motors has been based upon a 75 kW PPD280S-4 Flame Proof 3 Phase Induction Motor. A pump with a sound power level spectrum or similar to that presented in Table 15 can substituted.

Information provided to AECOM stated that the pump motor will produce a sound power level of 84 dB(A) from the entire installed unit (based the loudest direction surrounding the plant). The assessment has been conducted assuming the pumps have not benefitted from any mitigation or acoustic enclosure.

The following table presents the sound power levels for the pump motor at load that have been used for this assessment.

Table 15 Pump motor without attenuation sound power level

Description	Octave band noise levels, dB								
	O/A dB(A)	63	125	250	500	1000	2000	4000	8000
Fuel Pumps: Flame Proof 3 Phase Induction Motor	**84**	74	75	77	77	80	77	73	67

6.1.2 Ship/Tanker Auxiliary Power Unit and Newcastle Tug Boats

The predicted noise level from tankers docking at Berth 4 was sourced from Table 4-1 of the Wilkinson Murray acoustic assessment which provides indicative noise levels for typical equipment used in port facilities. The noise level from the ships power unit has been considered both for the movement of the vessel but also to represent the pumps on board to load fuel from the facility.

In addition, as the tanker approaches the wharf it will be assisted by Newcastle Harbour Tugs which would assist the ship to berth.

Table 16 provides assumed sound power noise levels for the activities associated with Berth 4.

Table 16 Berth 4 activities and sound power levels

Description	Octave band noise levels, dB								
	O/A dB(A)	63	125	250	500	1000	2000	4000	8000
Ship/Tanker Auxiliary Power Unit	**106**	118	110	107	103	102	94	83	83
Newcastle Harbour Tug Boats	**100**	116	111	103	95	87	85	83	76

6.1.3 Haulage Trucks and Forklift

Truck and forklift operations would take place over a 24 hour period. Typically truck would load fuel within a 45 min with 60% of the movements occurring between the hours of 7 am to 4 pm.

Truck movements have assumed that 36 truck movements for diesel dispatch occur per 24 hour period and 4 movements per 24 hour period to unload biodiesel. Considering 60% within the 7 am-4 pm gives, a worst 2.4 trucks in an hour, 3 trucks per hour has been assessed as a worst case scenario.

In addition, the use of a forklift has been considered as part of the operational site works. Table 17 offers the noise spectrum data for the haulage truck and forklift within the assessment.

Table 17 Assumed noise levels for haulage trucks and forklift

Description	Octave band noise levels, dB								
	O/A dB(A)	63	125	250	500	1000	2000	4000	8000
Haulage Truck	**100**	96	102	100	98	95	92	88	82
Forklift	**101**	73	80	90	92	97	95	91	90

6.2 Methodology

The modelling methodology assumed for the operational noise assessment were as described for assessment of construction noise.

6.2.1 General modelling assumptions

The following assumptions have been made in modelling all the operational noise emission scenarios:

- The Marstel Bulk Fuel Facility will operate at similar capacity during the entire 24 hour period;
- For all scenarios all equipment will be operating at the same time, which is unlikely, and is a conservative assumption; and
- The night-time period is the governing criteria.

6.2.2 Meteorological conditions modelled

Meteorological conditions such as the presence of a temperature inversion or light to moderate winds can have a significant effect on sound propagation.

Temperature inversions (i.e. when the normal temperature profile of the atmosphere is reversed such that the air temperature increases with increasing height above ground) typically occur at night and tend to assist the propagation of noise.

Likewise, a light to moderate wind (i.e. 1 to 3 m/s) from the source to the receiver tends to assist the propagation of noise to the receiver, while the impact of noise for any receivers in the opposite direction would be reduced. At wind speeds above approximately 5 m/s the wind becomes too turbulent to effectively assist the propagation of noise, and background noise levels tend to increase, masking any increases in noise level due to wind assisted propagation.

The lower Hunter and areas around Newcastle are well known to experience temperature inversions, and previous studies such as Wilkinson Murray Report No.09077 July 2010, and Spectrum Acoustics No 07314 September 2008 have noted that inversions are a prevailing meteorological condition of the area during the winter night periods. As a result, temperature inversions have been included in the assessment of predicted noise levels to nearby noise sensitive receivers.

It is noted in the OEH INP that in the case of assessment under temperature inversion conditions *"...for residents downhill from the source a drainage-wind-flow wind speed of 2m/s also applies."(OEH INP, 2000).* In this assessment the area surrounding the site is relatively flat and no residential receiver location is located at an elevation lower than the subject site. As a result, drainage wind associated with a temperature inversion has not been included in the assessment.

Therefore, for each potentially 'worst case' stage, noise levels were predicted at the noise sensitive receptors based on:

1) Neutral atmospheric conditions i.e. relatively calm, no temperature inversion;
2) Worst case atmospheric conditions i.e. temperature inversion. (3˚C/100m); and
3) Worst case wind conditions (3 m/s NW winds have been used on a bearing of 332 degrees, as this is worst case scenario between the site and the Carrington noise sensitive receivers)

6.2.3 Modelled operational scenarios

Modelling for the proposed operations has been undertaken against both the intrusiveness and amenity criterion. For each of the scenarios the following noise modelling was undertaken:

Worst case amenity scenario (9 hour period)

1) Ship unloading (Ship Auxiliary power unit (APU) being the dominant noise source) with Tug boats;
2) Bulk fuel facility operating;
3) Forklift operating 15 minutes / hour;
4) Two truck movements per hour. Refer to Section 6.1.3 for details; and
5) Three meteorological conditions modelled (refer to Section 6.2.2).

Worst case intrusiveness scenario (15 minute period)

1) Ship unloading (Ship Auxiliary power unit (APU) being the dominant noise source) with Tug boats;
2) Bulk fuel facility operating;
3) Forklift operating continuously during a 15 minute period;
4) Three truck movements during a 15 minute period. Refer to Section 6.1.3 for details; and
5) Three meteorological conditions modelled (refer to Section 6.2.2).

6.3 Predicted operational noise levels

6.3.1 Representative assessment receivers

The results of the environmental noise emissions during normal operations, temperature inversion and prevailing wind conditions, from the bulk fuel facility have been predicted to nearby representative receiver locations. The predicted noise levels presented in Table 18 are assessed against the INP amenity criteria and the predicted noise levels presented in Table 19 are assessed against the INP intrusiveness criteria. Noise contour maps for both scenarios are presented in Appendix B.

6.3.1.1 Amenity scenario

Table 18 Noise contribution at representative receiver locations during night-time operational conditions – Amenity criteria

Receiver	Criterion	Neutral		Temperature inversion (Class F, 3˚C/100m)		Worst case wind (North-west wind, 3m/s)	
		Result	Exceed	Result	Exceed	Result	Exceed
R1	37	24	-	29	-	22	-
R2	37	29	-	33	-	29	-
R3	37	27	-	32	-	24	-
R4	37	29	-	33	-	29	-
R5	42	19	-	23	-	24	-
R6	65	29	-	33	-	30	-
R7	37	27	-	32	-	23	-
R8	37	27	-	32	-	23	-
R9[2]	45	23	-	28	-	22	-
R10	70	43	-	45	-	41	-

Notes:

1. In the OEH INP the school classroom criteria is an internal noise level, with an acceptable noise level of 35 dB(A) and a recommended maximum of 40 dB(A). A 10 dB reduction has been assumed between external and internal noise levels based upon a window being open for adequate natural ventilation.
2. The noise impacts on schools are to be assessed during school hours. As there is not a significant variation in noise levels between the day and night operations, the predicted night time noise levels at the school have been assessed against the school criteria to determine the noise impact.

6.3.1.2 Intrusiveness scenario

Table 19 Noise contribution at representative receiver locations during night-time operational conditions – Intrusiveness criteria

Receiver	Criterion	Neutral		Temperature inversion (Class F, 3˚C/100m)		Worst case wind (North-west wind, 3m/s)	
		Result	Exceed	Result	Exceed	Result	Exceed
R1	48	25	-	30	-	30	-
R2	48	30	-	34	-	34	-
R3	48	28	-	32	-	32	-
R4	48	30	-	34	-	34	-
R5	42	19	-	24	-	24	-
R6	-	30	-	34	-	34	-
R7	48	28	-	33	-	33	-
R8	48	28	-	32	-	32	-
R9[2]	45	24	-	29	-	29	-
R10	-	48	-	49	-	49	-

Notes:

1. In the OEH INP the school classroom criteria is an internal noise level, with an acceptable noise level of 35 dB(A) and a recommended maximum of 40 dB(A). A 10 dB reduction has been assumed between external and internal noise levels based upon a window being open for adequate natural ventilation.
2. The noise impacts on schools are to be assessed during school hours. As there is not a significant variation in noise levels between the day and night operations, the predicted night time noise levels at the school have been assessed against the school criteria to determine the noise impact.

6.4 Sleep disturbance

The application notes for the OEH *Industrial Noise Policy* (2000) recommend that sleep disturbance is assessed based on the emergence of the $L_{A1\ (1\ minute)}$ noise level over the corresponding $L_{A90\ (15\ minute)}$ noise level.

The following screening criterion for sleep disturbance is recommended for the assessment of sleep disturbance:

$$L_{A1\ (1\ minute)} < L_{A90\ (15\ minute)} + 15\ dB(A)$$

The noise sources with the greatest potential for causing sleep disturbance are the operations of the trucks when they enter and leave the site, and unloading and berth operations at Berth 4, such as crane operations.

The operation of the truck and the forklift at the Bulk Fuel Facility and potential use of cranes on the ship at Berth 4 are identified as the key noise sources that could potentially cause sleep disturbance. The predicted $L_{A1\ (1\ minute)}$ noise levels are based upon attended measurements undertaken during previous noise assessments. An average increase from L_{Aeq} to L_{max} was found to be 8 dB(A) for general forklift operations, and has also been found to be a reasonable assumption for construction equipment such as truck and crane operations when undertaking construction noise assessments. As such 8 dB(A) has been added to the LAeq sound power level of the truck and forklift operations. The ships power unit at Berth 4 has been identified as the dominant noise source during operations at Berth 4. However, the ships power unit is a relatively constant noise source, and as such there would not be a significant variation between the $L_{A1\ (1\ minute)}$ and $L_{Aeq\ (15\ minute)}$ noise levels. A crane with a

sound power level $L_{A1\ (1\ minute)}$ of 108 dB(A) has instead been used for the sleep disturbance assessment of the ship operations at Berth 4.

An assessment of a typical reversing beeper with a maximum sound power level of 118 dB(A) has been modelled to determine the impact of a reversing beeper on residential receiver locations. The results of this assessment are shown in Table 20, and show that the recommended noise criterion is not exceeded at any residential receiver location.

The night-time sleep disturbance assessment has been undertaken against the most stringent meteorological condition, which for all receiver locations is the Class F temperature inversion scenario. The results are presented in Table 20. Noise contour maps are provided in Appendix B.

The 900 m separation between the site and the nearest residential receivers means that the maximum external noise levels are not predicted to exceed 49 dB(A) due to the night-time operations of the bulk fuel facility. Therefore, the assessment indicates compliance at all assessment locations during the night-time period.

Table 20 $L_{A1\ (1\ minute)}$ Noise contribution at representative sensitive receiver locations during night time operational conditions

Receiver	Criterion	Predicted $L_{A1\ (1\ minute)}$ with temperature inversion (Class F, 3°C/100m)			
		Result – Operations excluding reversing alarms	Exceed	Result – Reversing alarms	Exceed
R1	58	40	-	44	-
R2	58	45	-	48	-
R3	58	43	-	46	-
R4	58	43	-	48	-
R5	52	31	-	35	-
R6	-[1]	41	-	47	-
R7	58	46	-	49	-
R8	58	46	-	49	-
R9	-[1]	45	-	40	-
R10	-[1]	74	-	65	-

Note:

1. Only residential receivers have been assessed for sleep disturbance.

6.5 Cumulative noise impacts of concurrent operational activities

The OEH INP outlines that recommended total noise levels from industry at different receiver locations, and so in the case that there are other nearby industrial noise sources that are approved and will contribute to the overall noise level at nearby receiver locations, the cumulative impact of the other industrial sources should be considered. Table 21 presents that addition of existing industrial noise levels along with known approved nearby developments to consider the overall cumulative industrial noise level at nearby receiver locations.

Table 21 Predicted noise levels due to concurrent industrial noise emissions and operations of the Bulk Fuel Facility

Receiver location	Predicted noise level (external), $L_{Aeq\ 15\ minute}$ dB(A)				
	Existing and approved noise levels			Bulk Fuel Facility	
	Existing industrial ambient noise level[1]	NCIG[2] Coal Export Terminal[1]	Cumulative existing noise level excluding Bulk Fuel Facility	Predicted operational noise levels from Bulk Fuel Facility	Cumulative existing noise level including Bulk Fuel Facility
R1	45	44	48	30	48
R2	45	44	48	34	48
R3	45	44	48	32	48
R4	45	44	48	34	48
R5	42	36	43	24	43
R6	45	44	48	34	48
R7	45	44	48	33	48
R8	45	44	48	32	48
R9	45	44	48	29	48
R10	-	44		49	

Notes:

1. Existing noise levels have been adopted using the associated reference areas presented in Table 1. The predicted noise levels at Mayfield and Carrington areas have been predicted to in Spectrum Report project 07314 dated September 2008 and Newcastle Coal Infrastructure Group Coal Export Terminal Operational Noise Management Plan, Version 2 Development No. 06 0009, May 2010.
2. NCIG – Newcastle coal infrastructure group. These are maximum allowable noise contributions contained in Condition 2.13, Schedule 2 of the Minister for Planning Project Approval (06_0009).

Table 21, presents the predicted operational noise levels at nearby receiver locations, and shows that they are less than 10 dB below the predicted combined noise. As such the Bulk Fuel Facility noise emissions are predicted not increase the existing and approved noise levels at nearby receiver locations in Mayfield and Carrington.

6.6 Road traffic noise assessment

The existing traffic flows were determined from a RTA permanent count station, Station No. 05.953, located Mayfield West, west of Woodstock Street. It is proposed that the site will generate 56 movements per day by 2012, and 108 movements per day by 2016 as a direct result of the development. It has been concluded that if the proposed development were to go ahead, traffic on surrounding roads would be altered as detailed in Table 24.

Table 22 Potential traffic generation

Bulk Fuel Storage Facility	Adopted rates and movements
Road delivery movements	2012: 36 tanker movements per day, 10 PM peak hour movements. 2016: 68 tanker movements per day, 10 PM peak hour movements.
Staff/Visitor movements	2012: 20 vehicle movements per day, 10 PM peak hour movements. 2016: 40 vehicle movements per day, 10 PM peak hour movements.

Bulk Fuel Storage Facility	Adopted rates and movements
Project trip total	2012: Daily 56 movements. Peak 20 movements 2016: Daily 108 movements. Peak 20 movements.

Table 23 RTA Traffic count for Industrial Drive, Mayfield (RTA, 2005)

Station Number	Location	1995	1998	2001	2004
05.953	Mayfield Nth-West Of Woodstock St	29746	2954	30334	30717

The existing traffic flows were determined from the most recent published RTA permanent count station data for Station No. 05.953, located Mayfield West, west of Woodstock Street which is located 1.4km to the west of the location of the access road at the intersection of Industrial Drive and Ingall Street. It is proposed that the site will generate 56 movements per day by 2012, and 108 movements per day by 2016 as a direct result of the development. It has been concluded that if the proposed development were to go ahead, traffic on surrounding roads would be altered as detailed in Table 24.

Table 24 Summary of traffic flow increase

Location	Year	Existing[1]	Nett increase	% Increase	Increase in noise levels, dB(A)
Industrial drive, Mayfield Station No. 05.953	2012	30717	56[2]	0.2	<0.1
	2016		108[2]	0.4	<0.1

Notes

1. Traffic Numbers are based upon the Traffic Volume Data for Hunter and Northern Regions 2004, produced by the Roads and Traffic Authority.
2. This is the worst case scenario where all traffic movements from the site head in the same direction from the site along Industrial Drive, Mayfield, and this is based upon the lowest annual average traffic flow numbers on Industrial Drive in proximity of the site.

Predicted traffic noise increases on road surrounding the proposed development are less than 2 dB(A) for both the 2012 and 2016 scenarios based upon the estimated daily vehicle movements presented in Table 22. The existing traffic noise levels were presented in the Spectrum Report No.07314 dated September 2008. Even though the existing traffic noise levels exceed the recommended traffic noise criteria in accordance with the OEH RNP, the increase in traffic noise as a result of traffic from the project site would not have a noticeable impact on sensitive receivers adjacent to Industrial Drive, Mayfield, and it would not be reasonable or feasible to provide noise mitigation measures as the worst case traffic noise increase from the project site would not be noticeable to nearby receiver locations.

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7.0 Noise and Vibration Management and Mitigation Strategies

The ICNG accepts the fact that large scale construction often results in excessive noise, albeit on a temporary basis, and where physical mitigation options are limited, stresses the importance of community engagement in a frank and upfront manner.

The ICNG recommends that the contractor demonstrate best practicable means of controlling noise and include noise mitigation measures in the construction management plan to minimise the noise impact at sensitive receivers. This may include the work practices described below.

7.1 Construction hours

The proposed Bulk Fuel facility construction activities are recommended to be scheduled during ICNG standard construction hours (Monday to Friday – 7:00 am to 6:00 pm and Saturday – 8:00 am to 1:00 pm).

7.2 Standard mitigation measures

All construction activities associated with the site construction should be subject to the standard noise and vibration mitigation measures described below:

Where reasonable and feasible, apply best practice noise mitigation measures including:

- Maximise the offset distance between noisy plant items and nearby noise sensitive receivers;
- Avoiding the coincidence of noisy plants working simultaneously close together and adjacent to sensitive receivers would be avoided, where practicable;
- Where possible, equipment with directional noise emissions would be orientated away from sensitive receivers;
- Locate noisy plant away from potentially noise affected neighbours or behind barriers, such as sheds or walls;
- Loading and unloading would be carried out away from sensitive receivers, where practicable;
- The selection of site access points would take into account the proximity of noise sensitive receivers;
- Maintenance work on construction plants with the potential to generate noise impacts would be carried out away from noise sensitive receivers and confined to standard daytime construction hours, where possible;
- Minimising consecutive works in the same locality, where practicable;
- Turn off plant that is not being used;
- Examine, and implement where feasible and reasonable, alternative work practices which generate less noise – for example, use electric equipment instead of diesel or petrol powered equipment;
- Examine, and implement where feasible and reasonable, the use of silenced equipment and noise shielding around stationary plant (such as generators), subject to manufacturers' design requirements;
- Ensure plant is regularly maintained, and repair or replace equipment that becomes noisy;
- Arrange the work site to minimise the use of movement alarms on vehicles and mobile plant; and
- Undertake bulk fuel facility construction activities in accordance with the approved hours of work.

7.3 Respite periods

- There are no high impact noise activities proposed to take place, such as those likely to generate noise levels above L_{Aeq} 75 dB(A) or activities likely to generate noise with intermittent, impulsive, tonal or low-frequency characteristics which have the potential to affect the amenity of adjacent noise receivers; and
- In the case that high impact noise activities or activities likely to generate noise with intermittent, impulsive, tonal or low-frequency characteristics are required appropriate notification prior to works commencing and respite periods would have to be implemented.

7.4 Local road traffic – heavy vehicles noise mitigation

The following mitigation measures are proposed in order to minimise the impact of exceedances from heavy vehicles on local roads for the criteria at residential receiver locations:

- All trucks would be fitted with mufflers and any other noise control equipment in good working order.
- As far as practical and safety consideration, truck drivers would avoid:
    - Heavy acceleration and braking;
    - Compression braking;
    - Reversing as far as practicable;
    - High speeds;
    - Pick-ups and deliveries outside standard construction hours and
    - Idling outside noise sensitive receivers.

Truck routes to and from the worksite will be via major roads where possible, in accordance with the Traffic Management Protocol and Traffic Management Plan.

7.5 Equipment selection and maintenance

When carrying out the Bulk Fuel Facility construction works the contractor should select equipment taking into account noise and vibration emissions, such as (but not limited to):

- Smaller equipment options or rubber-tracked equipment where equipment is fit-for-purpose and economically feasible;
- All equipment would be maintained and operated in an efficient manner, in accordance with manufacturer's specifications, to reduce the potential for adverse noise and vibration impacts; and
- Regular checks of equipment noise levels would be made to ensure that noise levels do not increase as a result of poor maintenance practice or say the replacement of individual items of equipment with alternatives which have higher noise emissions.

8.0 Conclusion

This report presents the results of a study on construction and operational noise and vibration emission from the proposed Marstel Bulk Fuel Facility, which is to be located at Mayfield, New South Wales.

Construction noise and vibration

Noise producing construction activities with typical associated equipment have been modelled at the project site to give an indication of the noise emissions that the nearest residential and commercial receivers will experience.

The construction noise and vibration assessment was conducted in accordance with NSW Office of Environment and Heritage (OEH) '*Interim Construction Noise Guidelines' (ICNG, 2009)*.

The construction noise assessment indicates compliance with OEH's ICNG acoustic requirements at all assessment locations during the daytime (i.e. during OEH's standard construction hours).

The construction vibration assessment indicates that due to the large buffer distance between the project site and nearby residential receivers, the risk of discomfort, regenerated noise and structural damage impacting on receivers is extremely low.

Operational noise and vibration

The operational environmental noise emission criteria for the development have been quantified in Section 4.0 of this report and have been established to comply with the OEH's Industrial Noise Policy (INP, 2000).

The operational noise impact assessment indicates compliance under neutral and prevailing meteorological conditions at all assessment locations during the daytime, evening and night-time periods. Compliance is conditional that the equipment installed produce noise levels similar or less than those shown in Section 6.0.

No items of plant and equipment used in operation of the project site are expected to generate significant levels of vibration and therefore, operational vibration impacts are consequently expected to be negligible.

Sleep disturbance

The sleep disturbance assessment was conducted in accordance with OEH's INP guidelines. The assessment indicates compliance at all assessment locations during the night-time period.

Cumulative noise impacts

An assessment of the cumulative impact of concurrent construction noise and vibration activities was undertaken. As there are no other known approved construction activities to occur concurrently with the proposed construction works there will not be any additional increase in the predicted noise impacts from construction activities on nearby noise sensitive receiver locations.

An assessment of the cumulative operational noise and vibration impacts from other industrial sites nearby to the project site in addition to the project site was undertaken to determine the total noise exposure of nearby receivers. The assessment found that based upon the predicted noise levels the Bulk Fuel Facility noise emissions are predicted not increase the existing and approved noise levels at nearby receiver locations.

Road traffic noise

The construction and operational road traffic noise assessment was conducted in accordance with OEH's Road Noise Policy (RNP, 2011) guideline.

The road traffic noise assessment associated with construction and operational phases of the Bulk Fuel Facility indicates compliance with OEH's RNP acoustic criteria.

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Appendix A

Acoustic Terminology

Appendix A Acoustic Terminology

The following is a brief description of acoustic terminology used in this report.

Sound power level	Sound power level is the total sound energy produced by a sound source.
Sound pressure level	Sound pressure level is the portion of sound energy at a point a distance from the sound source.
Decibel [dB]	The measurement unit of sound.
A Weighted decibels [dB(A])	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).
Decibel scale	The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. A 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows:

0dB(A)	Threshold of human hearing
30dB(A)	A quiet country park
40dB(A)	Whisper in a library
50dB(A)	Open office space
70dB(A)	Inside a car on a freeway
80dB(A)	Outboard motor
90dB(A)	Heavy truck pass-by
100dB(A)	Jackhammer/Subway train
110 dB(A)	Rock Concert
115dB(A)	Limit of sound permitted in industry
120dB(A)	747 take off at 250 metres

Frequency [f]	The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high pitched sound and a low frequency to a low pitched sound.
Equivalent continuous sound level [L_{eq}]	The constant sound level which, when occurring over the same period of time, would result in the receiver experiencing the same amount of sound energy.
L_{max}	The maximum sound pressure level measured over the measurement period
L_{min}	The minimum sound pressure level measured over the measurement period.
L_{10}	The sound pressure level exceeded for 10% of the measurement period. For 10% of the measurement period it was louder than the L_{10}.
L_{90}	The sound pressure level exceeded for 90% of the measurement period. For 90% of the measurement period it was louder than the L_{90}.
Ambient noise	The all-encompassing noise at a point composed of sound from all sources near and far.

Background noise	The underlying level of noise present in the ambient noise when extraneous noise (such as transient traffic and dogs barking) is removed. The L90 sound pressure level is used to quantify background noise.
Traffic noise	The total noise resulting from road traffic. The L_{eq} sound pressure level is used to quantify traffic noise.
Day	The period from 0700 to 1800 h Monday to Saturday and 0800 to 1800 h Sundays and Public Holidays.
Evening	The period from 1800 to 2200 h Monday to Sunday and Public Holidays.
Night	The period from 2200 to 0700 h Monday to Saturday and 2200 to 0800 h Sundays and Public Holidays.
Assessment background level [ABL]	The overall background level for each day, evening and night period for each day of the noise monitoring.
Rating background level [RBL]	The overall background level for each day, evening and night period for the entire length of noise monitoring.

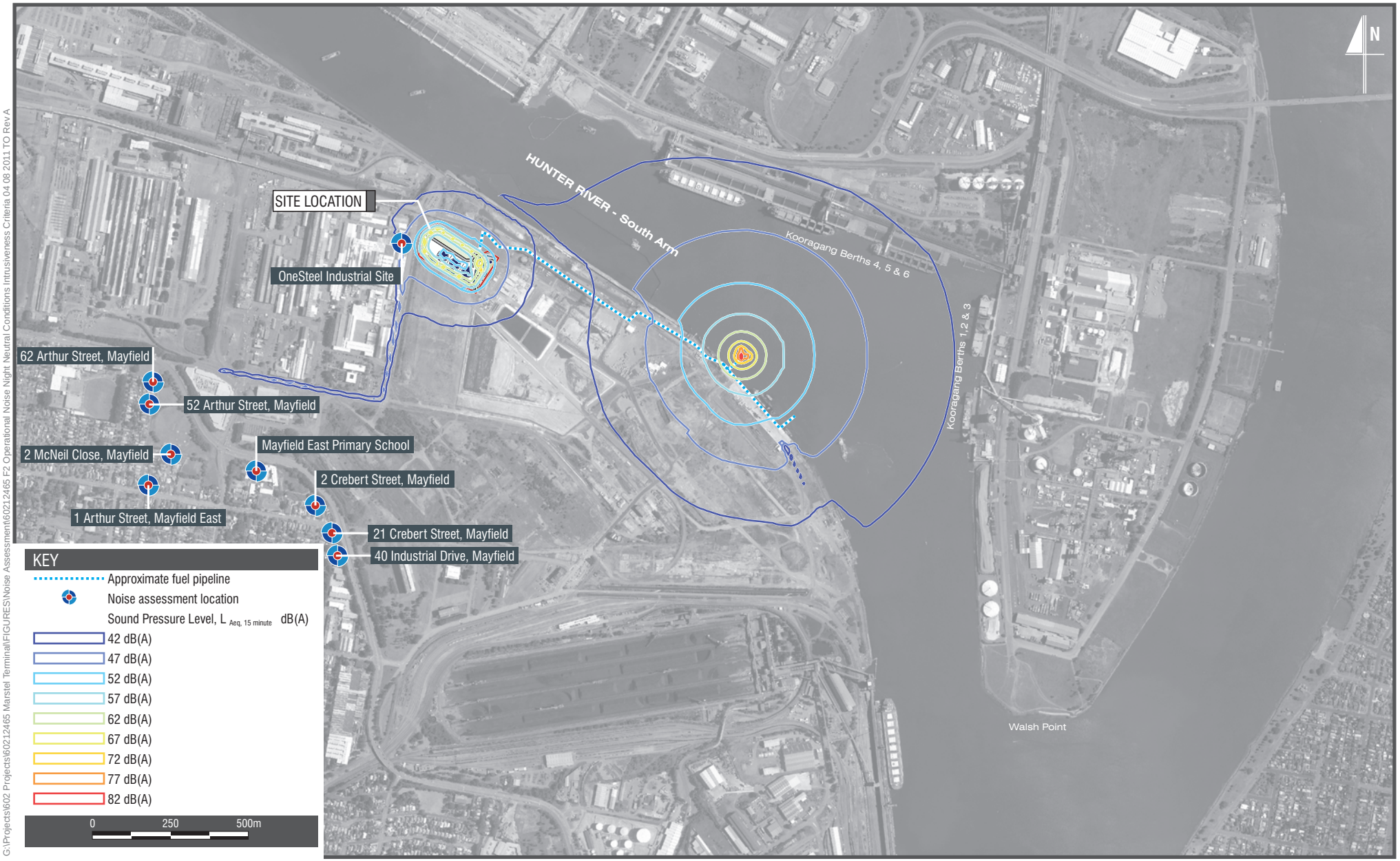
*Definitions of a number of terms have been adapted from Australian Standard AS1633:1985 “Acoustics – Glossary of terms and related symbols”, the OEH’s NSW Industrial Noise Policy and the OEH’s Road Noise Policy.

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Appendix B

Operational and Construction Noise Contour Maps

Appendix B Operational and Construction Noise Contour Maps



G:\Projects\602 Projects\60212465 Marstel Terminal\FIGURES\Noise Assessment\60212465 F2 Operational Noise Night Neutral Conditions Intrusiveness Criteria 04 08 2011 TO Rev A

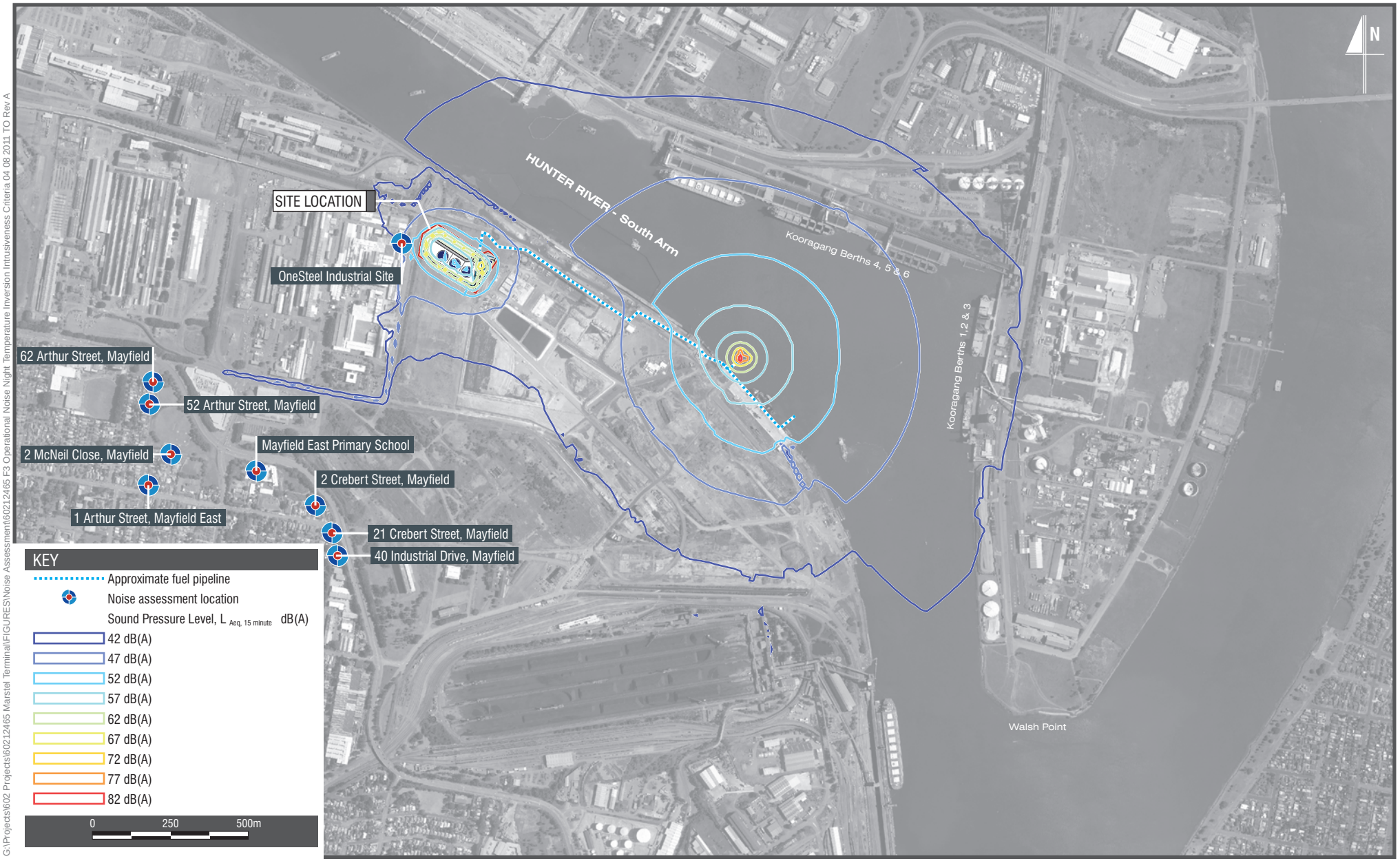
AECOM

OPERATIONAL NOISE - NIGHT - NEUTRAL CONDITIONS - INTRUSIVENESS CRITERIA

Noise Assessment

Port of Newcastle, New South Wales

FIGURE 2



G:\Projects\602 Projects\60212465 Marstel Terminal\FIGURES\Noise Assessment\60212465 F3 Operational Noise Night Temperature Inversion Intrusiveness Criteria 04 08 2011 TO Rev A

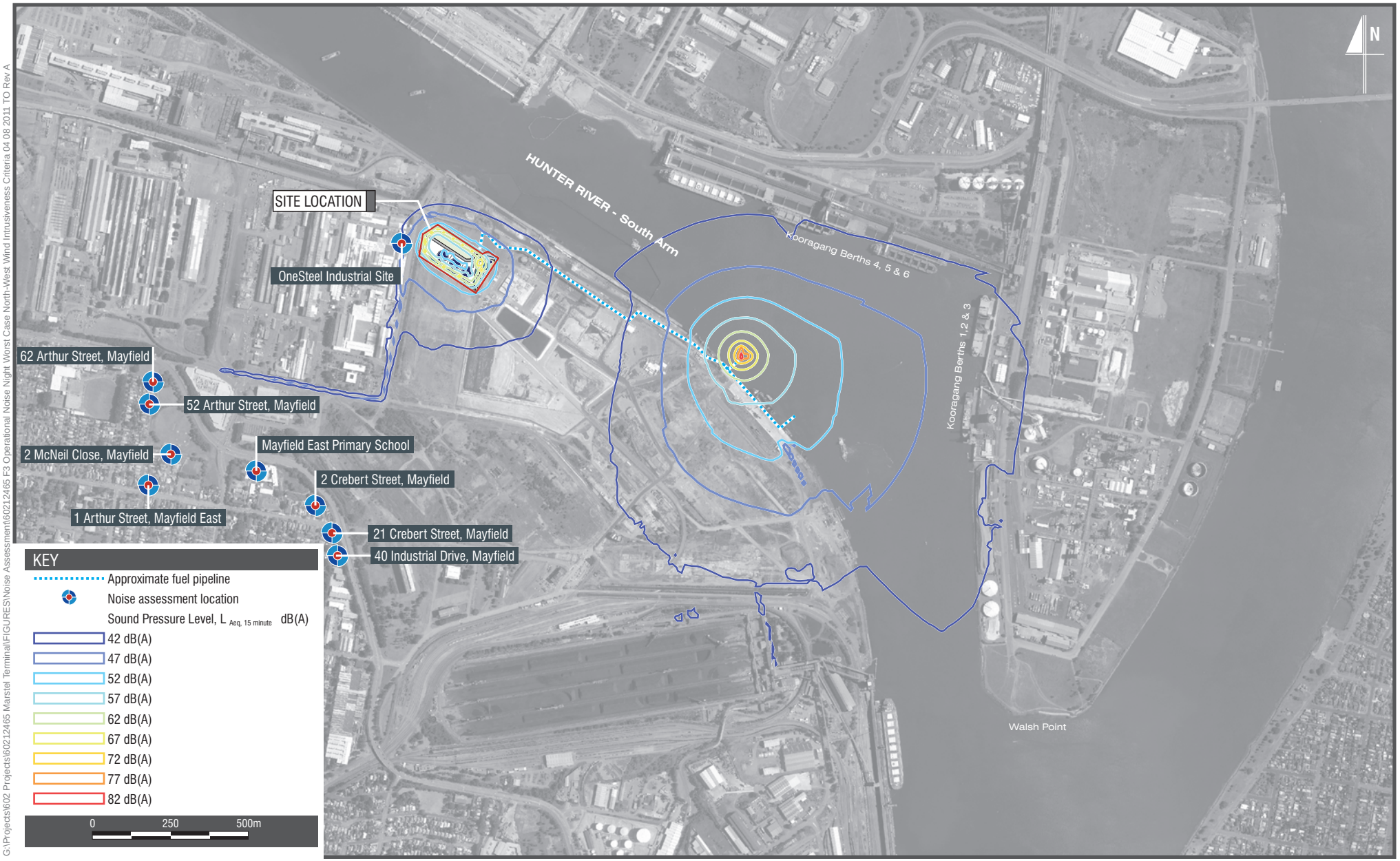
AECOM

OPERATIONAL NOISE - NIGHT - TEMPERATURE INVERSION - INTRUSIVENESS CRITERIA

Noise Assessment

Port of Newcastle, New South Wales

FIGURE 3



G:\Projects\602 Projects\60212465 Marstel Terminal\FIGURES\Noise Assessment\60212465 F3 Operational Noise Night Worst Case North-West Wind Intrusiveness Criteria 04 08 2011 TO Rev A

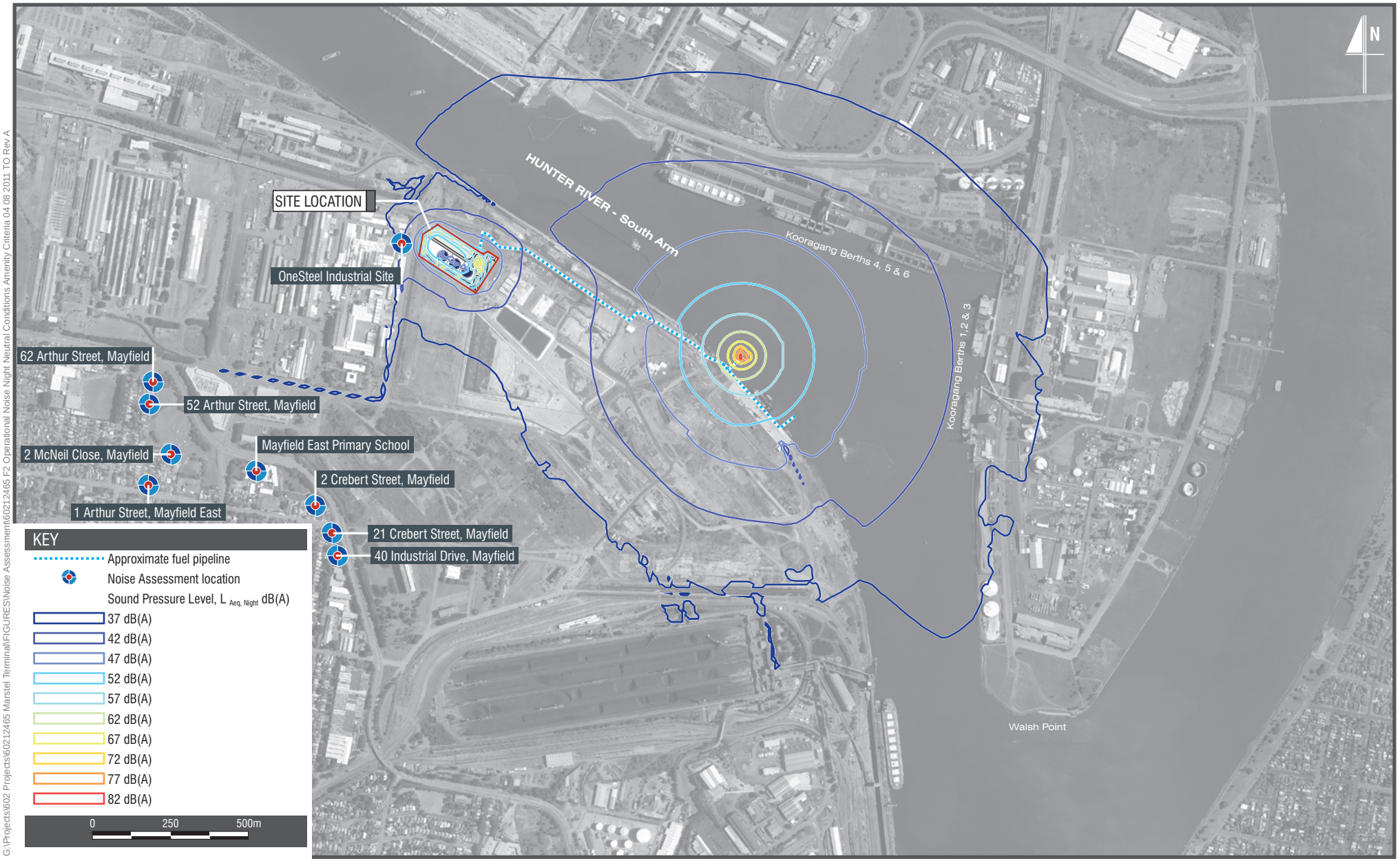
AECOM

OPERATIONAL NOISE - NIGHT - WORST CASE NORTH-WEST WIND - INTRUSIVENESS CRITERIA

Noise Assessment

Port of Newcastle, New South Wales

FIGURE 4



G:\Projects\602 Projects\60212465 Marstel Terminal\FIGURES\Noise Assessment\60212465 F2 Operational Noise Night Neutral Conditions Amenity Criteria 04 08 2011 TO Rev A

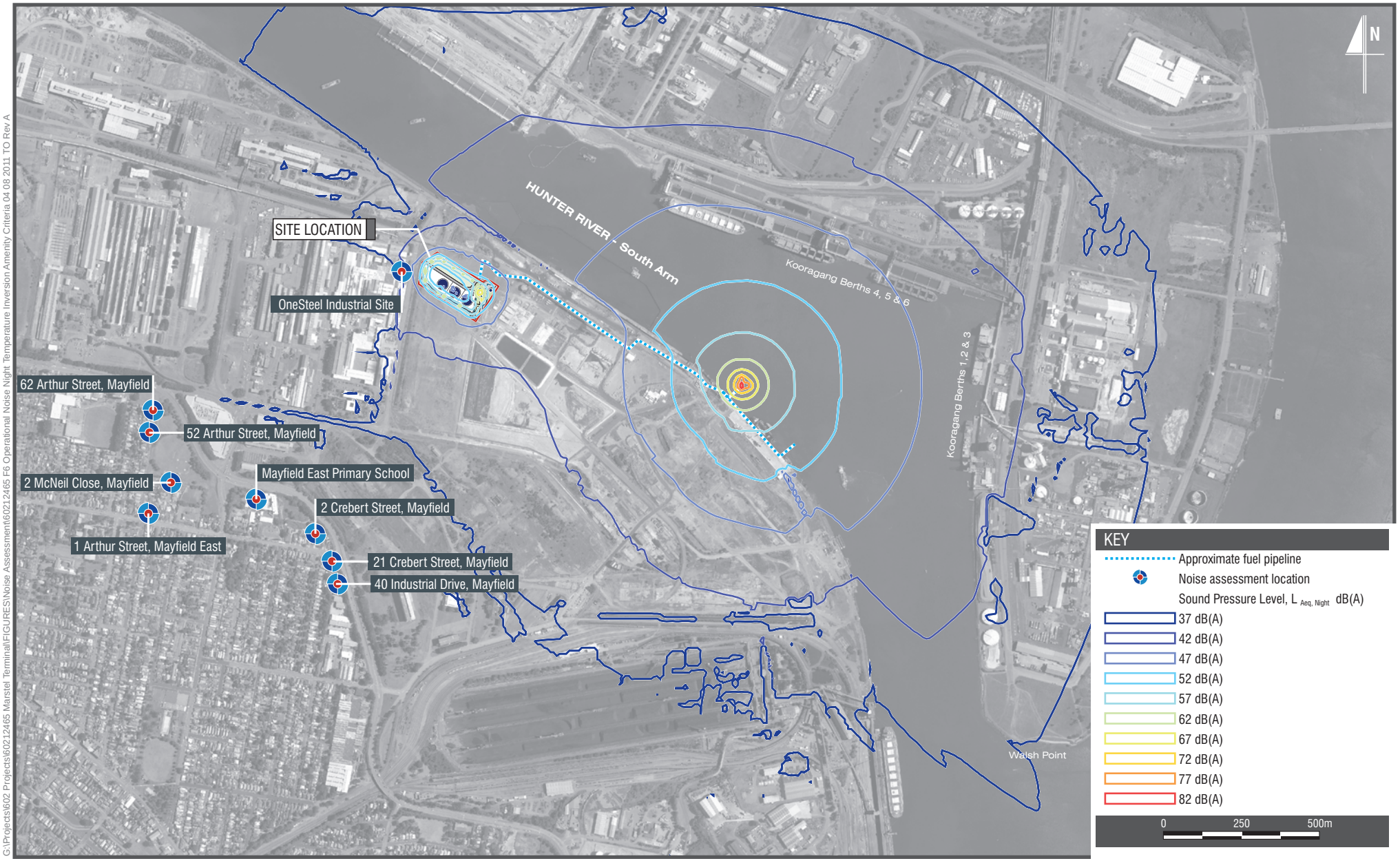
AECOM

OPERATIONAL NOISE - NIGHT - NEUTRAL CONDITIONS - AMENITY CRITERIA

Noise Assessment

Port of Newcastle, New South Wales

FIGURE 5



G:\Projects\602 Projects\60212465 Marstel Terminal\FIGURES\Noise Assessment\60212465 F6 Operational Noise Night Temperature Inversion Amenity Criteria 04 08 2011 TO Rev A

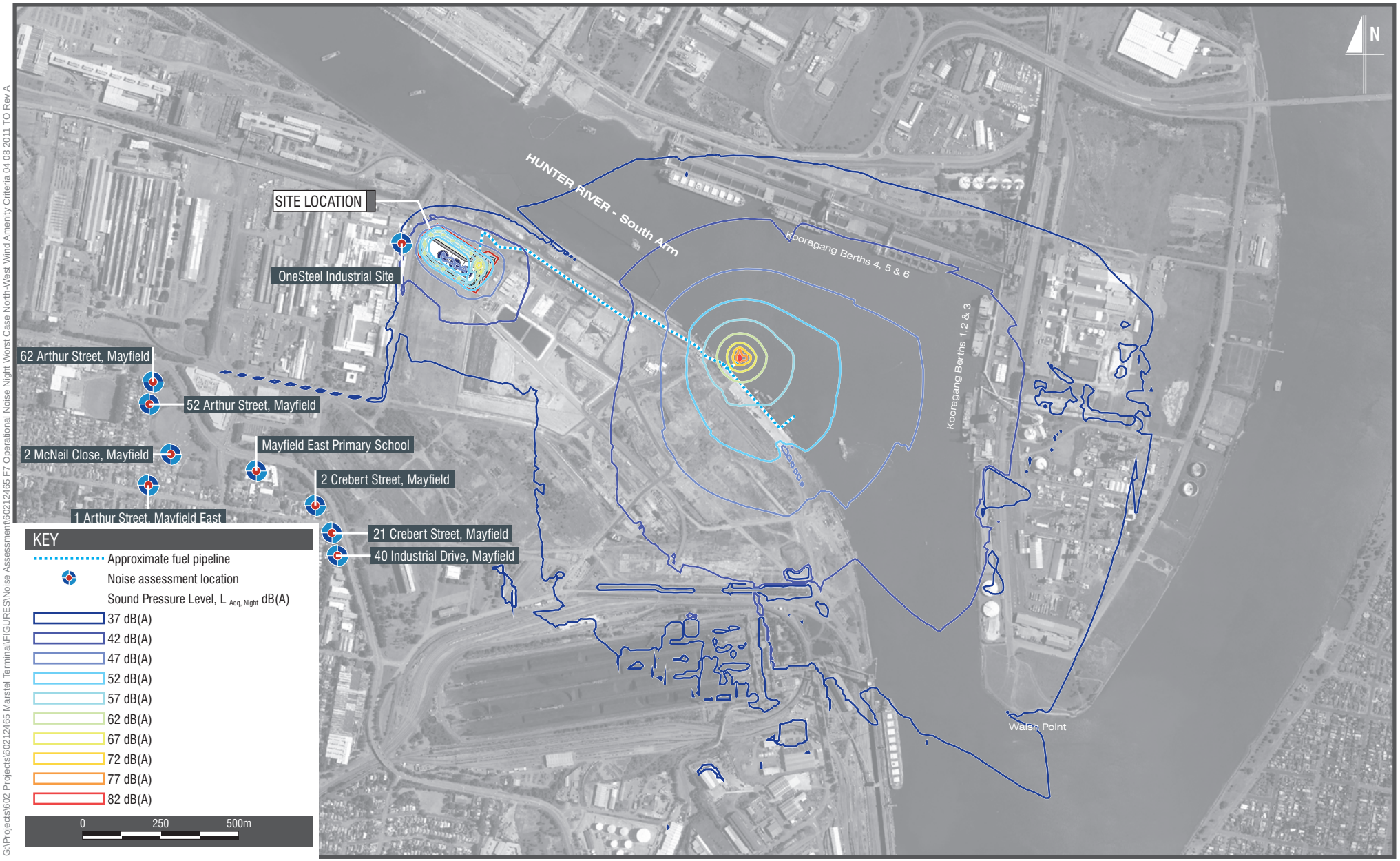
AECOM

OPERATIONAL NOISE - NIGHT - TEMPERATURE INVERSION - AMENITY CRITERIA

Noise Assessment

Port of Newcastle, New South Wales

FIGURE 6



G:\Projects\602 Projects\60212465 Marstel Terminal\FIGURES\Noise Assessment\60212465 F7 Operational Noise Night Worst Case North-West Wind Amenity Criteria 04 08 2011 TO Rev A

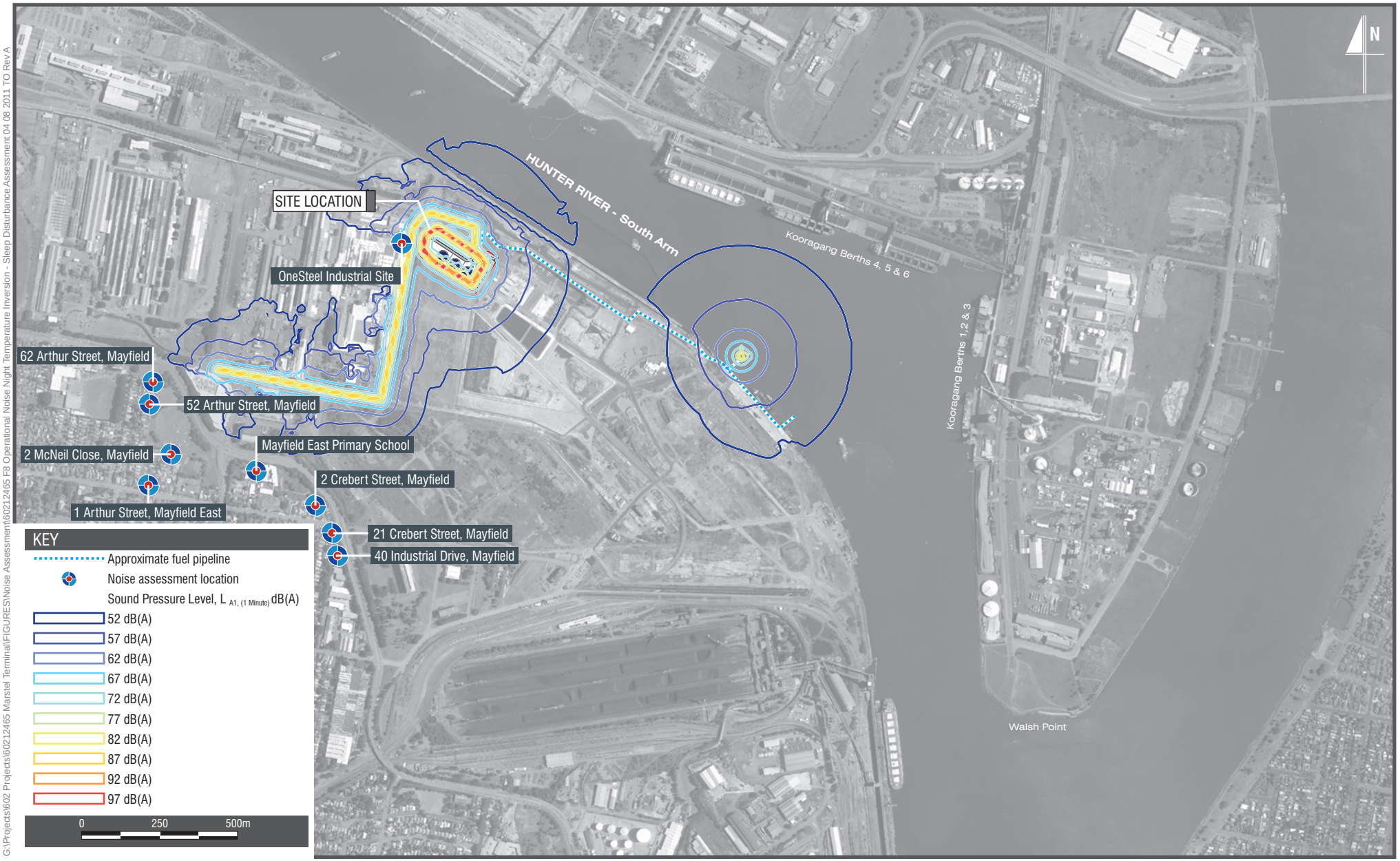
AECOM

OPERATIONAL NOISE - NIGHT - WORST CASE NORTH-WEST WIND - AMENITY CRITERIA

Noise Assessment

Port of Newcastle, New South Wales

FIGURE 7



G:\Projects\602 Projects\60212465 Marstel Terminal\FIGURES\Noise Assessment\60212465 F8 Operational Noise Night Temperature Inversion - Sleep Disturbance Assessment 04 08 2011 TO Rev A

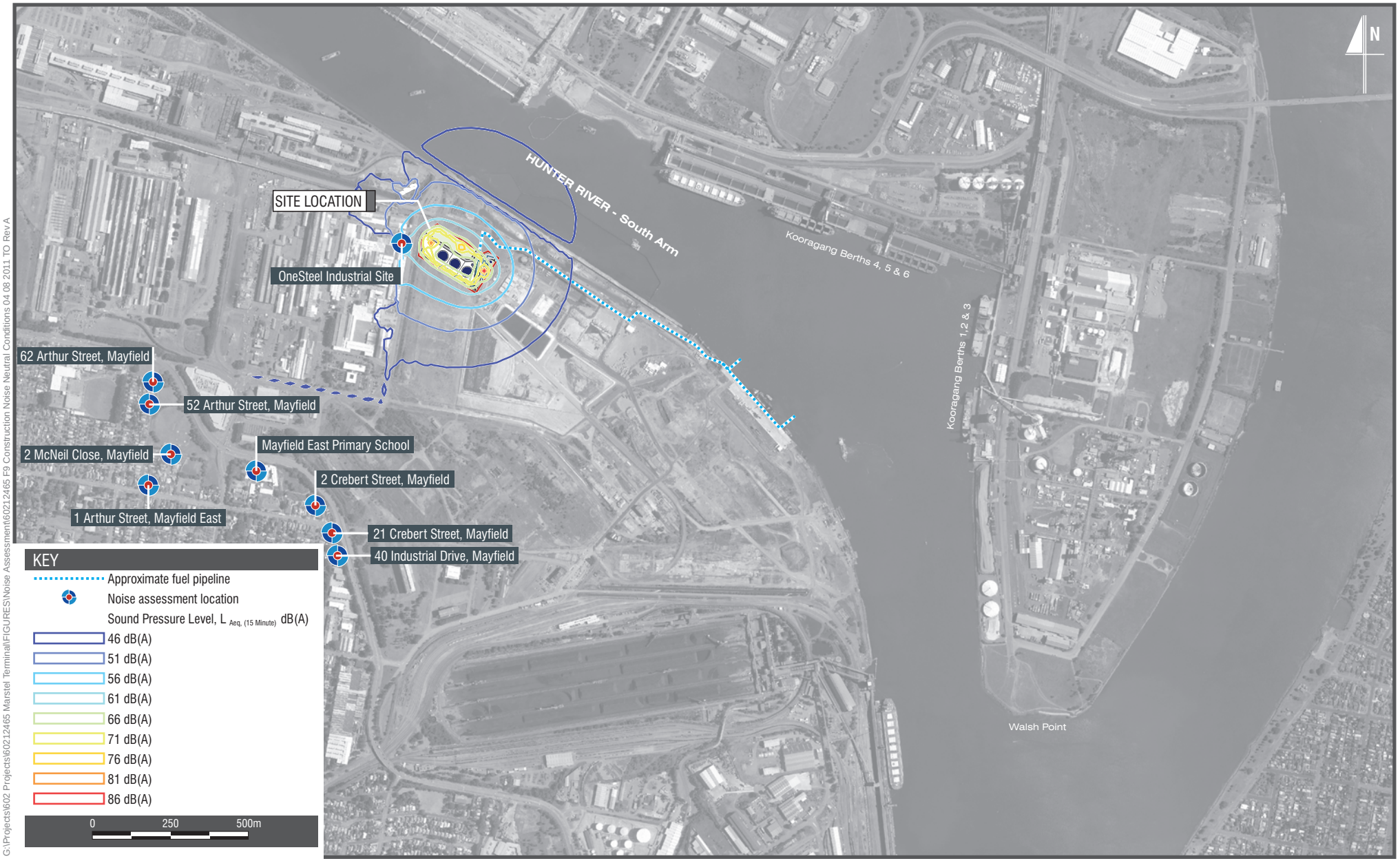
AECOM

OPERATIONAL NOISE - NIGHT - TEMPERATURE INVERSION - SLEEP DISTURBANCE ASSESSMENT

Noise Assessment

Port of Newcastle, New South Wales

FIGURE 8



G:\Projects\602 Projects\60212465 Marstel Terminal\FIGURES\Noise Assessment\60212465 F9 Construction Noise Neutral Conditions 04 08 2011 TO Rev A

AECOM

CONSTRUCTION NOISE - NEUTRAL CONDITIONS

Noise Assessment

Port of Newcastle, New South Wales

FIGURE 9

Appendix H

Heritage Database Searches

Appendix H Heritage Database Searches

Click on the BACK button of your browser to return to the search.

Statutory Listed Items

Information and items listed in the State Heritage Inventory come from a number of sources. This means that there may be several entries for the same heritage item in the database. For clarity, the search results have been divided into two sections.

- Section 1. contains items listed by the Heritage Council under the NSW Heritage Act. This includes listing on the State Heritage Register, an Interim Heritage Order or protected under section 136 of the NSW Heritage Act. This information is provided by the Heritage Branch.
- Section 2. contains items listed by Local Councils & Shires and State Government Agencies. This section may also contain additional information on some of the items listed in the first section.

Section 1. Items listed under the NSW Heritage Act.

Click on an item name to view the full details.
The search results can be re-sorted by clicking on the (sort) option at the top of each column.

Item Name (sort)	Address (sort)	Suburb (sort)	LGA (sort)	Listed Under Heritage Act

There were no records in this section matching your search criteria.

Section 2. Items listed by Local Government and State agencies.

Item Name (sort)	Address (sort)	Suburb (sort)	LGA (sort)	Information Source (sort)
12" Mill Building and Stack Yard (demolished)	99 Selwyn Street	Mayfield North	Newcastle	LGOV
18" Mill Building and Stack Yard (demolished)	99 Selwyn Street	Mayfield North	Newcastle	LGOV
1St Mill Building (demolished)	51 Industrial Drive	Mayfield North	Newcastle	LGOV
Ac Saltwater Pumphouse (demolished)	99 Selwyn Street	Mayfield North	Newcastle	LGOV
Administration Building Nos 2, 3 and 4	51 Industrial Drive	Mayfield North	Newcastle	LGOV
Administrative Building (1933)	141 Ingall Street	Mayfield North	Newcastle	LGOV
Apprentice Training Centre	141 Ingall Street	Mayfield North	Newcastle	LGOV
Australia Wire Rope Building	6 George Street	Mayfield East	Newcastle	LGOV
Beauford Hotel	39 Maitland Road	Mayfield	Newcastle	LGOV
Bella Vista (Former	105 Crebert	Mayfield	Newcastle	LGOV

Residence)	Street			
BHP Administration Building	99 Selwyn Street	Mayfield North	Newcastle	LGOV
Bos Plant (demolished)	99 Selwyn Street	Mayfield North	Newcastle	LGOV
Botanic Garden Site (Former)	24-30 Crebert Street	Mayfield East	Newcastle	LGOV
Burgman House	4 Pitt Street	Mayfield	Newcastle	LGOV
Burrundulla (Residence)	2 Pitt Street	Mayfield	Newcastle	LGOV
Catholic School Of Christ The King, Former	3 Fitzroy Street	Mayfield	Newcastle	LGOV
Church House	29-31 Highfield Street	Mayfield	Newcastle	LGOV
Cycle Sheds & No. 2 Rod Mill (demolished)	51 Industrial Drive	Mayfield North	Newcastle	LGOV
Dangar Park	21A Maitland Road	Mayfield	Newcastle	LGOV
Date Palms	21A Maitland Road	Mayfield	Newcastle	LGOV
Dc Substation (demolished)	99 Selwyn Street	Mayfield North	Newcastle	LGOV
Delprat's Quarters	99 Selwyn Street	Mayfield North	Newcastle	LGOV
Electricity Substation No. 1126	2C Maud Street	Mayfield	Newcastle	SGOV
Elladale	358 Maitland Road	Mayfield	Newcastle	LGOV
Glen Airlie (Arnott Residence)	41 Kerr Street	Mayfield	Newcastle	LGOV
Hann Street Distribution Substation	8 Hann Street	Mayfield	Newcastle	SGOV
House and Picket Fence	41 Elizabeth Street	Mayfield	Newcastle	LGOV
House and Picket Fence	72 Elizabeth Street	Mayfield	Newcastle	LGOV
Hunter Institute of Technology	52 Havelock Street	Mayfield	Newcastle	LGOV
Ingall House	61 Crebert Street	Mayfield	Newcastle	LGOV
Ingall House Group	47 Crebert Street	Mayfield	Newcastle	LGOV
Ingall House Group	51 Crebert Street	Mayfield	Newcastle	LGOV
Master Mechanics Office	99 Selwyn Street	Mayfield North	Newcastle	LGOV
Maternity Hospital (Former)	1 Buruda Street	Mayfield West	Newcastle	LGOV
Mayfield East Public School	34 Crebert Street	Mayfield East	Newcastle	LGOV
Mayfield Fitzroy Substation	Fitzroy Street	Mayfield	Newcastle	SGOV
Mayfield House	Highfield Street	Mayfield	Newcastle	LGOV

Mayfield Police Station	219-221A Maitland Road	Mayfield	Newcastle	LGOV
Mayfield Uniting Church	31 Highfield Street	Mayfield	Newcastle	LGOV
Mayfield West Public School	7 Gregson Avenue	Mayfield West	Newcastle	LGOV
Migrant Camp (Former)	609 Maitland Road	Mayfield West	Newcastle	LGOV
Mould Conditioning Building	99 Selwyn Street	Mayfield North	Newcastle	LGOV
No 1 Change House (demolished)	51 Industrial Drive	Mayfield North	Newcastle	LGOV
No. 1 Rod Mill Building (demolished)	99 Selwyn Street	Mayfield North	Newcastle	LGOV
No.1 Bloom and Rail Mill (demolished)	51 Industrial Drive	Mayfield North	Newcastle	LGOV
No.1 Blower House (demolished)	99 Selwyn Street	Mayfield North	Newcastle	LGOV
No.3 Blast Furnace (demolished)	99 Selwyn Street	Mayfield North	Newcastle	LGOV
No.4 Blast Furnace and Stoves (demolished)	99 Selwyn Street	Mayfield North	Newcastle	LGOV
Open Hearth Building (demolished)	99 Selwyn Street	Mayfield North	Newcastle	LGOV
Open Hearth Change House (demolished)	99 Selwyn Street	Mayfield North	Newcastle	LGOV
Original Timber Wharves	99 Selwyn Street	Mayfield North	Newcastle	LGOV
Pattern Store	99 Selwyn Street	Mayfield North	Newcastle	LGOV
Powerhouse (demolished)	99 Selwyn Street	Mayfield North	Newcastle	LGOV
Quality Control Laboratory	99 Selwyn Street	Mayfield North	Newcastle	LGOV
Redemptorist Monastery	68 Woodstock Street	Mayfield	Newcastle	LGOV
Remnant Garden	50 McIntosh Drive	Mayfield West	Newcastle	LGOV
Remnant Monastery Garden	68 Woodstock Street	Mayfield	Newcastle	LGOV
Remnant No.1 Blast Furnace	99 Selwyn Street	Mayfield North	Newcastle	LGOV
Residence	76 Kerr Street	Mayfield	Newcastle	LGOV
Residence	28 Bull Street	Mayfield	Newcastle	LGOV
Residence	92 Margaret Street	Mayfield East	Newcastle	LGOV
Residence	94 Margaret	Mayfield	Newcastle	LGOV

	Street			
Residence	88 Hanbury Street	Mayfield	Newcastle	LGOV
Residence	141 Crebert Street	Mayfield	Newcastle	LGOV
Residence	145 Crebert Street	Mayfield	Newcastle	LGOV
Residence	15 Kerr Street	Mayfield	Newcastle	LGOV
Residence	147 Crebert Street	Mayfield	Newcastle	LGOV
Residence	74 Bull Street	Mayfield	Newcastle	LGOV
Salvation Army Citadel	3 Victoria Street	Mayfield	Newcastle	LGOV
San Clemente School	78 Havelock Street	Mayfield	Newcastle	LGOV
Simpsons Cottage	64 Industrial Drive	Mayfield	Newcastle	LGOV
Soaking Pits Building (demolished)	99 Selwyn Street	Mayfield North	Newcastle	LGOV
St Andrews Church	31A Church Street	Mayfield	Newcastle	LGOV
St Andrews Rectory (Former)	5 Durham Street	Mayfield	Newcastle	LGOV
St. Columban's Primary School	39 Church Street	Mayfield	Newcastle	LGOV
St. Columbans Presbytery	58 Church Street	Mayfield	Newcastle	LGOV
St. John Presbyterian Church	33A Hanbury Street	Mayfield	Newcastle	LGOV
Stag & Hunter Hotel	185 Maitland Road	Mayfield	Newcastle	LGOV
Steel Foundry (demolished)	99 Selwyn Street	Mayfield North	Newcastle	LGOV
Substation	2 Maud Street	Mayfield West	Newcastle	LGOV
Substation (Former)	138A Crebert Street	Mayfield	Newcastle	LGOV
The Coliseum (Commercial Building)	116-122 Maitland Road	Mayfield	Newcastle	LGOV
Tongarra	149 Crebert Street	Mayfield	Newcastle	LGOV
Tool Room	99 Selwyn Street	Mayfield North	Newcastle	LGOV
Webb Park	86A Hanbury Street	Mayfield	Newcastle	LGOV
Winahra (Residence)	21 Highfield Street	Mayfield	Newcastle	LGOV
Winncourt (Residence)	143 Crebert Street	Mayfield	Newcastle	LGOV

There were 87 records in this section matching your search criteria.

There was a total of 87 records matching your search criteria.

Key:
LGA = Local Government Area
GAZ = NSW Government Gazette (statutory listings prior to 1997), HGA = Heritage Grant Application, HS = Heritage Study, LGOV = Local Government, SGOV = State Government Agency.

Note: The Heritage Branch seeks to keep the State Heritage Inventory (SHI) up to date, however the latest listings in Local and Regional Environmental Plans (LEPs and REPs) may not yet be included. Always check with the relevant Local Council or Shire for the most recent listings.

AUSTRALIAN HERITAGE PLACES INVENTORY

[New Search]

No records matched your query.

Report produced : 3/6/2011
AHPI URL : http://www.environment.gov.au/heritage/ahpi/index.html

Newcastle Local Environmental Plan 2003

Schedule 6 Heritage items and heritage conservation areas

(Clause 37 and Schedule 2)

Part 1 Heritage items

Suburb	Item name	Address	Property description	Significance
Adamstown	Adamstown Post Office	195 Brunker Road	Lot 1 DP 222812	Local
Adamstown	Former Adamstown Public School	201 Brunker Road	Lot 3263 DP 822183	Local
Adamstown	Adamstown Uniting Church	228 Brunker Road	Lot 1 DP 126604	Local
Adamstown	Nag's Head Hotel	268 Brunker Road	Lot B DP 319138	Local
Adamstown	Kitchener Hall	269 Brunker Road	Lot 2 DP 227081	Local
Adamstown	Adamstown RSL Memorial Hall	278 Brunker Road	Lot 2 DP 1002163	Local
Adamstown	Former Rifle Range	351 Brunker Road	Lot 102 DP 1037972	Local
Adamstown	Adamstown Signal Box	Cnr Glebe Road and Park Avenue	Railway land	Local
Adamstown	Adamstown Park	506 Glebe Road	Pt Lot 3156 DP 755247	Local
Adamstown	Gates Hotel	660 Glebe Road	Lots 7 and 8 Sec A DP 2347	Local
Adamstown	St Columba Primary School	153 Lockyer Street	Pt Lot 35 and Lots 36–45 Sec 7 DP 1141	Local
Adamstown	Former Church	153 Lockyer Street	Pt Lot 35 and Lots 36–45 Sec 7 DP 1141	Local
Adamstown	Police Residence	65 Narara Road	Lot 3276 DP 823771	Local
Adamstown	Adamstown Police Station	67 Narara Road	Lot 3277 DP 823771	Local
Adamstown	Pedestrian Bridge	Park Avenue	Railway land	Local
Adamstown	Adamstown Railway Station	10 Park Avenue	Railway land	Local
Adamstown	New Redhead Estate Coal Co's Railway	29 Park Avenue	Lot 5 DP 589266	Local
Adamstown	Adamstown Masonic Hall	151 Teralba Road	Lot 1888 DP 755247	Local
Adamstown	Former Royal Standard Hotel	67 Victoria Street	Lot 100 DP 715282	Local

Bar Beach	Units	26 Brooks Street	SP 52934	Local
Bar Beach	Kamarem Court (Residential units)	289–293 Darby Street	SP 12800	Local
Bar Beach	Former King Edwards Girls Home	313 Darby Street	Lot 11 DP 1082583, Lot 2665 DP 755247	Local
Bar Beach	Shed	334A Darby Street	Lot 100 DP 883543	Local
Bar Beach	Empire Park	1 Kilgour Avenue	Pt Lot 258 DP 755247	Local
Bar Beach	Cooks Hill Life Saving Memorial	1 Kilgour Avenue	Pt Lot 258 DP 755247	Local
Bar Beach	Reid Park Tennis Clubhouse and Tennis Courts	1–7 Kilgour Avenue	Pt Lot 258 and Lot 3140 DP 755247	Local
Bar Beach	Empire Park Bowling Club Fence	29 Kilgour Avenue	Lot 3141 DP 755247	Local
Bar Beach	Electrical Substation	17 Light Street	Lot 2 DP 37815	Local
Bar Beach	Cooks Hill Surf Life Saving Club	107–109 Memorial Drive	Pt Lot 258 DP 755247	Local
Bar Beach	Residence	10 Parkway Ave	Lot 2 DP 513566	Local
Bar Beach	Parkhurst Flats	17 Parkway Avenue	Lot 25 DP 32532	Local
Bar Beach	Units	23 Parkway Avenue	SP 22152	Local
Bar Beach	Acropolis (Residential units)	40 Parkway Avenue	SP 33214	Local
Bar Beach	Brooklyn Court (Residential units)	6 Tooke Street	SP 9251	Local
Beresfield	Newcastle Crematorium	176 Anderson Drive	Lot 1 DP 186908, Lot 1 DP 221744, Lot 11 DP 553141, Lot 29 DP 29481	Local
Beresfield	Beresfield Public School	181 Anderson Drive	Lot 1 DP 782678, Lot 1 DP 544214, Lots 182–184, 188 and 189 DP 12628	Local
Birmingham Gardens	The Regal Cinema	4 Moore Street	Lots 90 and 91 DP 12691	Local
Birmingham Gardens	Wallsend General Cemetery	164 Sandgate Road	Ms 658 Md	Local
Broadmeadow	Remnant Plantings, District Park	6 Bavin Road	Pt Lot 1502 DP 755247	Local
Broadmeadow	Fire Station—Hamilton	9 Belford Street	Lot 1 DP 77912	Local
Broadmeadow	Goninans (Industrial site)	16 Broadmeadow Road	Lot 1 DP 530737, Lot 218 DP 805924, Lot 221 DP 1012345	Local
Broadmeadow	English & Australian Copper Co (Industrial site)	16 Broadmeadow Road	Lot 1 DP 530737, Lot 218 DP 805924, Lot 221 DP 1012345	Local
Broadmeadow	Former Lambton Colliery Railway (Relic)	16 Broadmeadow Road	Lot 1 DP 530737, Lot 218 DP 805924, Lot 221 DP 1012345	Local
Broadmeadow	Sunnyside Hotel	20 Broadmeadow Road	Lot 216 DP 777695	Local
Broadmeadow	St Lawrence O'Toole Church	127–131 Broadmeadow Road	Lot 2233 DP 755247, Lots 1 and 2 DP 184402, Lot 1 DP 664791	Local
Broadmeadow	Arthur Park	93A Brunker Road	Lot 1807 DP 755247	Local

Broadmeadow	Newcastle Showground	1A Curley Road	Lots 2498 and 2583 DP 755247, Lot A DP 186497	Local
Broadmeadow	Entire Broadmeadow Racetrack site	100 Darling Street	Lot 13 DP 227704	Local
Broadmeadow	Former Broadmeadow Aero Club (incorporating former main hangar and preparation bay building)	2 Denny Street	Lot 2 DP 578356	Local
Broadmeadow	Fig trees in median strip	Dumaresq Street		Local
Broadmeadow	Broadmeadow Railway Station	36 Graham Road	Railway land	Local
Broadmeadow	Bridge over Graham Road	Lambton Road		Local
Broadmeadow	Broadmeadow Primary School	115 Lambton Road	Pt Lot 2525 DP 755247	Local
Broadmeadow	Broadmeadow Locomotive Depot Offices	1A Newton Street	Railway land	Local
Broadmeadow	Broadmeadow Locomotive Depot	1A Newton Street	Railway land	State
Broadmeadow	Former Locomotive Depot Workers accommodation	1B Newton Street		Local
Carrington	Former Carrington Club Hotel	83–85 Bourke Street	Lot 1 Sec 38 DP 300	Local
Carrington	Hydraulic Power Station	106 Bourke Street	Lot 3 DP 834572	State
Carrington	Connolly Park War Memorial Gate	1B Cowper Street North	DP 758233	Local
Carrington	Earp Woodcock Beveridge & Co (Industrial site)	8 Cowper Street South	Pt Lot 100 DP 1014244	Local
Carrington	Armstrong & Royce Timber Mill	8 Cowper Street South	Pt Lot 100 DP 1014244	Local
Carrington	Club Hotel	26 Cowper Street North	Lot 1 DP 79693	Local
Carrington	The Seven Seas Hotel	33 Cowper Street North	Lot 1 DP 102046	Local
Carrington	Throsby Basin Warehouse	Denison Street		State
Carrington	Palms	Gipps Street		Local
Carrington	Mary McKillop Home	58 Gipps Street	Lot 7 Sec 43 DP 755247	Local
Carrington	St Francis Xavier Catholic Church	60 Gipps Street	Lot 8A Sec 43 DP 755247	Local
Carrington	Date palms	Hargrave Street		Local
Carrington	Former Council Chambers	1A Hargrave Street	Lot 1 Sec 51 DP 755247	Local
Carrington	Former Morrison Bearby Warehouse (Facade only)	92 Hill Street	Lot 11 DP 1023961	Local
Carrington	Mathieson Street Terraces	2–18 Mathieson Street	Lot 1 DP 910260, Lots 1–8 DP 8631	Local

Carrington	Bullock Island Crane Bases	38 Robertson Street	Lot 1 DP 834572	Local
Carrington	Former McMyler Hoist	61 Robertson Street	Lot 2 DP 834572	Local
Carrington	Carrington Fire Station	51 Young Street	Lot 4 Sec 36 DP 755247	Local
Carrington	Carrington Public School	88 Young Street	Lots 1–3 DP 4715, Lots 6–8 Sec 37 DP 755247	Local
Carrington	Everyones Theatre	92A Young Street	Lot 1 DP 151605	Local
Carrington	St Thomas Anglican Church and Hall	95 Young Street	Lot 32 DP 843193	Local
Carrington	Carrington Post Office	97 Young Street	Lot 11 Sec 32 DP 755247	Local
Carrington	Quambi (Residence)	110 Young Street	Lot 2 DP 3687	Local
Carrington	Almora (Residence)	112 Young Street	Lot 3 DP 3687	Local
Carrington	Shop	121 Young Street	Lot 1 DP 312270	Local
Carrington	Carrington House (Residence)	130 Young Street	Lot 1 DP 179625	Local
Carrington	Oriental Hotel	132 Young Street	Lot 10 DP 656932	Local
Carrington	Former Glasgow Arms Hotel	140 Young Street	Lots 37–39 DP 78	Local
Carrington	Cosmopolitan Hotel	151 Young Street	Lot 1 DP 923985	Local
Cooks Hill	Strathearn Terrace Group	92–98 Bull Street	Lot 1 DP 715763, Lot 1 DP 194245, Lots 1 and 2 DP 739440	Local
Cooks Hill	Residence	30 Corlette Street	Lot 640 DP 630631	Local
Cooks Hill	Horse Trough	Corner of Darby and Young Streets		Local
Cooks Hill	Former St Hilda's Hostel	250 Darby Street	Lot 2 DP 872146	Local
Cooks Hill	Normanton (Residence)	37 Dawson Street	Lot 112 DP 815683	Local
Cooks Hill	Terraces	111–113 Dawson Street	Lots 100 and 101 DP 557432	Local
Cooks Hill	Nickimble Terrace Group	115–123 Dawson Street	Lots 10–14 DP 244348	Local
Cooks Hill	Former Signalman's Cottage	12 Laman Street	Lot 11 DP 150135	Local
Cooks Hill	Former Railway Overpass	12 Laman Street	Lot 12 DP 150135	Local
Cooks Hill	St Andrews Presbyterian Church	12 Laman Street	Lot 10 DP 95189	State
Cooks Hill	Baptist Tabernacle	25 Laman Street	Pt Lot 19 Sec G DP 978941	State
Cooks Hill	Von Bertouch Galleries	61 Laman Street	Lot 1 DP 851075, Lot 21 DP 825796	Local
Cooks Hill	Cooks Hill Special School	100–102 Laman Street	Lots 250 and 251 DP 749870	Local
Cooks Hill	Dr Watkins House	64 Parkway Avenue	Lots 125 and 126 DP 37825	Local
Cooks Hill	Residence	79 Parkway Avenue	Lot 115 DP 154294	Local
Cooks Hill	St Johns Church, Hall and grounds	1B Parry Street	Lot 1 DP 872146	State
Cooks Hill	Thorns Terrace	45 Railway Street	Lot 101 Sec H DP 554480	Local

Cooks Hill	Thorns Terrace	47 Railway Street	Lot 102 Sec H DP 554480	Local
Cooks Hill	Thorns Terrace	49 Railway Street	Lot 103 Sec H DP 554480	Local
Cooks Hill	Thorns Terrace	51 Railway Street	Lot 104 Sec H DP 554480	Local
Cooks Hill	Thorns Terrace	53 Railway Street	Lot 1 DP 998338	Local
Cooks Hill	Thorns Terrace	55 Railway Street	Lot 1 DP 745052	Local
Cooks Hill	Thorns Terrace	57 Railway Street	Lot 1 DP 198284	Local
Cooks Hill	Thorns Terrace	59 Railway Street	Lot 8 DP 137527	Local
Cooks Hill	Terrace	92–94 Railway Street	Lot 1 DP 711571	Local
Cooks Hill	Terrace	39 Union Street	Lot 761 DP 626207	Local
Cooks Hill	Terrace	41 Union Street	Lot 760 DP 626207	Local
Cooks Hill	Terrace	43 Union Street	Pt Lot 76 Sec J DP 978941	Local
Cooks Hill	Fire Station	44 Union Street	Lot 1 DP 77102	Local
Cooks Hill	Terrace	45 Union Street	Lot 1 DP 197740	Local
Cooks Hill	Leslieville (Former residence)	63 Union Street	Lot 801 DP 535282	State
Elermore Vale	Jubilee ventilation shaft (Wallsend Colliery)	124 Cardiff Road	Lot 20A DP 17677	Local
Elermore Vale	Former West Wallsend Steam Tram Line	Glendale to Wallsend		Local
Hamilton	Station Buildings and Signal Box	1A Beaumont Street	Railway land	Local
Hamilton	Sydney Junction Hotel	8 Beaumont Street	Lot X DP 374327, Lot 1 DP 86246, Lot 11 DP 89305	Local
Hamilton	Former Masonic Hall	104 Beaumont Street	Lot 77 DP 700187	Local
Hamilton	Wesley Church	152 Beaumont Street	Lots 1–3 DP 770155	Local
Hamilton	Wesley Church Gates and Fence	152 Beaumont Street	Lots 1–3 DP 770155, Lot B DP 154392	Local
Hamilton	Terrace (including iron fence and gate)	21 Cameron Street	Lot 1 DP 744660	Local
Hamilton	Date palms	Chaucer Street		Local
Hamilton	Former Steam Tramshed	89 Denison Street	Lot 112 DP 1005089	Local
Hamilton	War Memorial (Steam Tram Memorial)	89 Denison Street	Lot 112 DP 1005089	Local
Hamilton	Former Hamilton Hotel	100 Denison Street	Lot 1 DP 75471	Local
Hamilton	Exchange Hotel	125–127 Denison Street	Lot 1 DP 76276	Local
Hamilton	Hotel Bennett	146 Denison Street	Lot 1 DP 89300	Local
Hamilton	St Peters Anglican Church	148 Denison Street	Lot 2 Sec F DP 192808	Local
Hamilton	A A House	195–197 Denison Street	Lot 22 DP 879044, Lot 3 DP 153592	State
Hamilton	Large fig tree	Denison Street and Lawson Street		Local
Hamilton	Eddy Street residence	4 Eddy Street	Lot 29 Sec L DP 10482831	Local

Hamilton	Eddy Street residence	6 Eddy Street	Pt Lot 28 Sec L DP 10482831	Local
Hamilton	Eddy Street residence	8 Eddy Street	Lot 27 DP 770646	Local
Hamilton	Eddy Street residence	10 Eddy Street	Lot 26 DP 996741	Local
Hamilton	Eddy Street residence	12 Eddy Street	Lot 1 DP 780907	Local
Hamilton	Eddy Street residence	14 Eddy Street	Lot 24 DP 735930	Local
Hamilton	Eddy Street residence	16 Eddy Street	Lot 1 DP 795000	Local
Hamilton	Eddy Street residence	18 Eddy Street	Lot 1 DP 194918	Local
Hamilton	Anona (Residence including front fence)	36 Gordon Avenue	Lot 11 DP 708981	Local
Hamilton	A A Company Display Home	141 Gordon Avenue	Pt Lot 1 DP 95144	Local
Hamilton	A A Company Display Home	154 Gordon Avenue	Lot 1 DP 797151	Local
Hamilton	Hely Brothers Pty Ltd (Industrial site)	48 Hudson Street	Pt Lot 3 DP 508048, Pt Lots 15 and 16 DP 95247, Lot 17 and Pt Lot 18 DP 999640	Local
Hamilton	Residence	48 Hudson Street	Pt Lot 15 DP 95247	Local
Hamilton	Former Flour Mill	56 Hudson Street	SP 58951	Local
Hamilton	Former Hamilton Volunteer Fire Station	38 James Street	Lot 1 DP 194909	Local
Hamilton	Police Station	57 James Street	Lot 1 DP 795449	Local
Hamilton	Hamilton Post Office	56 Lindsay Street	Lot 2862 DP 755247	Local
Hamilton	Fettercairn (Former residence and hospital)	65 Lindsay Street	Lot 1 DP 194569	Local
Hamilton	Former Nurses Home	66 Lindsay Street	Lot 1 DP 799840	Local
Hamilton	Chelsea (Residence)	68 Lindsay Street	Lot E DP 447913	Local
Hamilton	Hamilton Nursing Home	22–24 Samdon Street	Lots 5–7 DP 558137	Local
Hamilton	Hamilton Hotel	71 Tudor Street	Lot 351 DP 585827	Local
Hamilton	Scots Kirk Presbyterian Church	94 Tudor Street	Lot 101 DP 837017	Local
Hamilton	Former Bank of New South Wales	103 Tudor Street	Lot 100 DP 624615	Local
Hamilton	Anzac House (Former Mechanics Institute)	117 Tudor Street	Lots 2 and 3 DP 524404	Local
Hamilton	Hamilton Public School	127A Tudor Street	Lot 2 DP 809375	Local
Hamilton	Gregson Park	130A Tudor Street	Lot 1 DP 95154	Local
Hamilton	John William Parsons Monument	130A Tudor Street	Lot 1 DP 95154	Local
Hamilton	Gregson Park Tudor Street Gates	130A Tudor Street	Lot 1 DP 95154	Local
Hamilton	War Memorial—Gregson Park	130A Tudor Street	Lot 1 DP 95154	Local
Hamilton	Fountain Monument—Gregson Park	130A Tudor Street	Lot 1 DP 95154	Local
Hamilton	Gregson Park Steel Street Gates	130A Tudor Street	Lot 1 DP 95154	Local
Hamilton	Wesley Church Hall	19 William Street	Lot 1 DP 770161	Local
Hamilton East	House (including front fence)	58 Denison Street	Lot 1 DP 770590	Local

Hamilton East	House	60 Denison Street	Lot 1 DP 744771	Local
Hamilton East	Newcastle District Ambulance Station	77 Denison Street	Lot 183 DP 539432	Local
Hamilton East	Fig trees	Stewart Avenue		Local
Hamilton North	Gas Co Site Remnant Gardens	1 Chatham Road	Lot 1 DP 79057	Local
Hamilton North	Newcastle Gas Co Office	1 Chatham Road	Lot 1 DP 79057	Local
Hamilton North	Pump House and fence	1 Chatham Road	Lot 1 DP 79057	Local
Hamilton North	Shell Company of Australia (Industrial site)	5–7 Chatham Road	Lot 1 DP 77996	Local
Hamilton North	Pipeline Clifton Bros (Former residence)	5–7 Chatham Road	Lot 1 DP 77996	Local
Hamilton North	Richardson Park	16 Chatham Road	Lot 2436 DP 755247, Lot 2418 DP 755247	Local
Hamilton North	Former Scout Hall	16 Chatham Road	Lot 2954 DP 755247	Local
Hamilton North	ELMA Factory	52–54 Clyde Street	Lot 102 DP 1024980	Local
Hamilton South	Learmonth Park	80A Gordon Avenue	Lot 21 DP 95334	Local
Hamilton South	Learmonth Park Pillars	80A Gordon Avenue	Lot 21 DP 95334	Local
Hamilton South	The Gables (Residence)	152 Gordon Avenue	Lot 54 DP 662931	Local
Hamilton South	Newcastle High School	25A National Park Street	Lot 1 DP 150725, Lot 1 DP 575171, Lot 1 DP 794827	Local
Hamilton South	House	135 Parkway Avenue	Lot 90 DP 37549	Local
Hexham	Railway Station	Maitland Road	Railway land	Local
Hexham	Former Travellers Rest Hotel	23 Maitland Road	Lot 1 DP 659925	Local
Hexham	Oak Factory	189 Maitland Road	Lot 2 DP 802350	Local
Hexham	Hannel Family Vault	398B Maitland Road	Lot 1 DP 974950	Local
Hexham	Slab Shed	2 Old Maitland Road	Pt Lot 7002 DP 1052280	Local
Hexham	Former Uniting Church and Hall	63 Old Maitland Road	Lot 2 DP 546494	Local
Hexham	Former Glen Lovett Hall	187 Old Maitland Road	Lot A DP 157693	Local
Hexham	Former Hexham Public School	227 Old Maitland Road	Lot 102 DP 499013	Local
Hexham	Hexham Shipbuilding Yards	230 Old Maitland Road	Lot 12 DP 855330	Local
Hexham	Goninans Administration Building	230 Old Maitland Road	Lot 12 DP 855330	Local
Hexham	J & A Brown's Hexham Workshops	230 Old Maitland Road	Lot 12 DP 855330	Local
Hexham	Hexham Bridge	Pacific Highway		Local
Islington	Venetia (Residence)	111 Albert Street	Lot 1 DP 415171	Local
Islington	Islington RSL Memorial Hall	113 Albert Street	Lot 1 DP 344553	Local
Islington	Terrace	60 Chinchen Street	Lot 1 DP 709948	Local
Islington	Terrace	62 Chinchen Street	Lot 1 DP 136616	Local

Islington	Terrace	64 Chinchen Street	Lot 1 DP 1031915	Local
Islington	Terrace	66 Chinchen Street	Lot 1 DP 195202	Local
Islington	Terrace	68 Chinchen Street	Pt Lot 7 Sec A DP 192668	Local
Islington	Terrace	70 Chinchen Street	Lot 1 DP 779533	Local
Islington	Islington Junction Box	Clyde Street	Railway land	Local
Islington	Hamilton Station Hotel	6 Fern Street	Lot 1 DP 75464	Local
Islington	Former Dick Bros Engineering building	62 Fern Street	Lots 1–4 DP 782730	Local
Islington	Public School (including trees)	17 Hubbard Street	Lot 2 DP 797777	Local
Islington	Residence	22 Maitland Road	Lot C DP 334618	Local
Islington	Former Regent Picture Theatre	80 Maitland Road	Lot 1 DP 88359	Local
Islington	Islington Park	151A Maitland Road	Ms 735 Md, Lot 3182 DP 257283, Lots A and B DP 37022, Lot 1 DP 337010	Local
Islington	St Marks Anglican Church	5 Norfolk Avenue	Lots 1–3 Sec B DP 978072	Local
Islington	St Marks Rectory	9 Norfolk Avenue	Pt Lot 4 Sec B DP 978072, Lot 21 DP 9652	Local
Islington	Winchombe Carson Warehouse	13 Roslyn Avenue	Lot 201 DP 583258	Local
Islington	Kenilworth (Residence)	14 Sheddon Street	Lots 1–2 Sec G DP 2331, Lot 17 Sec G DP 2331	Local
Jesmond	Marquis of Midlothian Hotel	42 Robert Street	Lot 91 DP 791194	Local
Kooragang	Tongues Tree Fig	Kooragang Nature Reserve		Local
Kooragang	Palm	Greenleaf Road		Local
Kooragang	131 Radar Igloo (Building)	200 Kooragang Street	Lot 1 DP 126347	State
Kooragang	School Master's House	200 Kooragang Street	Lot 1 DP 126347	Local
Lambton	Lambton Anglican Church	19 Church Street	Lot 230 DP 1035097	Local
Lambton	Lambton Public School	18 Croudace Street	Lot 1 DP 804236	Local
Lambton	Lambton Fire Station	67 De Vitre Street	Lot 854 DP 755247	Local
Lambton	Former Lambton Police Station and Lock-up Residence	22 Dickson Street	Lot 2414 DP 755247	Local
Lambton	Post Office	37 Dickson Street	Lot 1 DP 815096	Local
Lambton	Bethal Congregational Church	43A Dickson Street	Lot 56 DP 777623	Local
Lambton	Convent of Mercy	69A Dickson Street	Lot 1 DP 3, Lot 1 DP 907508, Lots 4–6 DP 907509	Local
Lambton	St John Catholic Church	82 Dickson Street	Pt Lot 6 Sec B DP 3, Lot 1 DP 255158, Lot 16 DP 119115	Local

Lambton	St John Presbytery	82 Dickson Street	Pt Lot 6 Sec B DP 3, Lot 1 DP 255158, Lot 16 DP 119115	Local
Lambton	Lambton Mechanics Institute Hall	68 Elder Street	Lot 330 DP 755247	Local
Lambton	Shopfront	106 Elder Street	Lot 4 DP 813318	Local
Lambton	Le Chalet (Residence)	130 Elder Street	Lots 10 and 11 Sec F DP 3	Local
Lambton	Uniting Church	136 Elder Street	Lot 7 Sec F DP 3	Local
Lambton	Lambton Park	50 Howe Street	Pt DP 755247	Local
Lambton	Lambton Park Drinking Fountain	50 Howe Street	Pt DP 755247	Local
Lambton	Lambton Park Gates	50 Howe Street	Pt DP 755247	Local
Lambton	Lambton Park Rotunda	50 Howe Street	Pt DP 755247	Local
Lambton	Lambton Library (Formerly Lambton Municipal Chambers)	50 Howe Street	Pt DP 755247	Local
Lambton	The Lambton Park Hotel	60 Howe Street	Lot 1 DP 442480	Local
Lambton	Residence	64 Howe Street	Lots A and B DP 435770	Local
Lambton	Cartrefle (Residence)	79 Howe Street	Lot 2 DP 301561	Local
Lambton	Lambton Anglican Rectory	18 Morehead Street	Lot 231 DP 1035097	Local
Lambton	Lambton Masonic Hall	22A Morehead Street	Lot 849 DP 755247	Local
Lambton	Kings Theatre (Former Coronation Hall)	31 Morehead Street	Lot 2 DP 334833	Local
Lambton	Lambton Pumping Station	307A Newcastle Road	Lot 2 DP 787983	Local
Maryland	Glendor Thomas Family Grave	79 Callan Avenue	Lot 3 DP 839872	Local
Maryland	Styles Grove Landscape (Moreton Bay fig trees)	256 Minmi Road	Lot 611 DP 1034932	Local
Maryland	Styles Grove (Former residence and farm buildings)	256 Minmi Road	Lot 611 DP 1034932	Local
Maryville	Maryville Postal Pillar Box	Harrison Street		Local
Maryville	Remnant Tuckeroos (trees)	Williams Street		Local
Mayfield	Residence	28 Bull Street	Lot 1 DP 815609	Local
Mayfield	Residence	74 Bull Street	Lot 2 DP 336905	Local
Mayfield	St Andrews Church	31A Church Street	Lot 3 DP 544502	Local
Mayfield	St Columban's Church	39 Church Street	Lot 4 DP 509134	Local
Mayfield	St Columbans Presbytery	58 Church Street	Lot 1 DP 66978	Local
Mayfield	Ingall House group	47 Crebert Street	Lot 211 DP 871588	Local
Mayfield	Ingall House group	51 Crebert Street	Lot 1 DP 213056	Local
Mayfield	Ingall House	61 Crebert Street	Lot 13 DP 538578	Local
Mayfield	Bella Vista (Former residence)	105 Crebert Street	Lot 141 DP 716312	Local
Mayfield	Former Substation	138A Crebert Street	Lot A DP 164300	Local

Mayfield	Residence	141 Crebert Street	Lot B DP 37452	Local
Mayfield	Winncourt (Residence)	143 Crebert Street	Lot 2 DP 523690	Local
Mayfield	Residence	145 Crebert Street	Lots 9 and 10 Sec C DP 978483, Pt Lots 26 and 27 Sec C DP 978483	Local
Mayfield	Residence	147 Crebert Street	Lot A DP 160509	Local
Mayfield	Tongarra (Residence)	149 Crebert Street	Lot 51 DP 1022725	Local
Mayfield	Former St Andrews Rectory	1 Durham Street	Lot 2 DP 544502	Local
Mayfield	House and picket fence	41 Elizabeth Street	Lots 30–32 Sec I DP 975066	Local
Mayfield	House and picket fence	72 Elizabeth Street	Lot A DP 367045	Local
Mayfield	Trees at site of Catholic School of Christ the King	3 Fitzroy Street	Lot 110 DP 1023101	Local
Mayfield	St John Presbyterian Church	33A Hanbury Street	Lots 1A, 1B and 1C Sec D DP 977626, Lot 3A Sec D DP 977626	Local
Mayfield	Webb Park	86A Hanbury Street	Lots 1–3 DP 185977	Local
Mayfield	Residence	88 Hanbury Street	Lot 1 DP 332193, Lot 1 DP 127928, Lot 1 DP 322926	Local
Mayfield	Hunter Institute of Technology	52 Havelock Street	Lot 1 DP 875242	Local
Mayfield	San Clemente School	78 Havelock Street	Lot 1 DP 818888, Lots 2 and 3 DP 230245	Local
Mayfield	Mayfield House	Highfield Street		Local
Mayfield	Winahra (Residence)	21 Highfield Street	Lot 1 DP 342048	Local
Mayfield	Church House	29–31 Highfield Street	Pt Lots 1–3 Sec B DP 978483	Local
Mayfield	Mayfield Uniting Church	29–31 Highfield Street	Pt Lots 1–3 Sec B DP 978483	Local
Mayfield	Simpsons Cottage	64 Industrial Drive	Lot 20 Sec B DP 16844	Local
Mayfield	Residence	15 Kerr Street	Lot 11 DP 537479	Local
Mayfield	Glen Airlie, (Arnott Residence)	41 Kerr Street	Lot B DP 378684	Local
Mayfield	Residence	76 Kerr Street	Lot A DP 360878	Local
Mayfield	Dangar Park	21A Maitland Road	Pt Lot 128 DP 755247	Local
Mayfield	Date palms	21A Maitland Road	Pt Lot 128 DP 755247	Local
Mayfield	Beauford Hotel	39 Maitland Road	Lots 4–7 Sec J DP 3626	Local
Mayfield	The Coliseum (Commercial building)	116–122 Maitland Road	Lots 183 and 184 DP 95371	Local
Mayfield	Stag & Hunter Hotel	185 Maitland Road	Lot 1 DP 80473	Local
Mayfield	Mayfield Police Station	219–221A Maitland Road	Lot 1 DP 711020, Lot 2 DP 784164	Local
Mayfield	Elladale (Former residence)	358 Maitland Road	Lot 1 DP 806145	Local

Mayfield	Residence	94 Margaret Street	Lot 22 DP 563077	Local
Mayfield	Burrundulla (Residence)	2 Pitt Street	Lot B DP 161146	Local
Mayfield	Burgman House	4 Pitt Street	Lots A and B DP 163111	Local
Mayfield	Salvation Army Citadel	3 Victoria Street	Lot 1 DP 74234, Lot 24 DP 540764	Local
Mayfield	Redemptorist Monastery	68 Woodstock Street	Lot 4 DP 546404	Local
Mayfield	Remnant Monastery Garden	68 Woodstock Street	Lot 4 DP 546404	Local
Mayfield East	Former Botanic Garden Site	24–30 Crebert Street	Lots 90 and 91 DP 1022901, Lot 100 DP 875896	Local
Mayfield East	Mayfield East Public School	34 Crebert Street	Pt Lot 225 DP 755247, Lot 1 DP 195848, Lot 2 DP 610699	Local
Mayfield East	Australia Wire Rope Building	6 George Street	Lot 1 DP 577013	Local
Mayfield East	Residence	92 Margaret Street	Lot 23 DP 563077	Local
Mayfield North	No 1 Bloom & Rail Mill	51 Industrial Drive	Lot 225 DP 1013964	State
Mayfield North	Administration Buildings Nos 2, 3 and 4	51 Industrial Drive	Lot 225 DP 1013964	Local
Mayfield North	No 1 Change House	51 Industrial Drive	Lot 225 DP 1013964	Local
Mayfield North	1st Mill Building	51 Industrial Drive	Lot 225 DP 1013964	Local
Mayfield North	Cycle Sheds and No 2 Rod Mill	141 Ingall Street	Lot 224 DP 1013964	Local
Mayfield North	Apprentice Training Centre	141 Ingall Street	Lot 224 DP 1013964	Local
Mayfield North	Administration Building, 1933	141 Ingall Street	Lot 224 DP 1013964	Local
Mayfield North	No 1 Blower House	99 Selwyn Street	Lot 221 DP 1013964	State
Mayfield North	Soaking Pits Building	99 Selwyn Street	Lot 221 DP 1013964	State
Mayfield North	No 3 Blast Furnace	99 Selwyn Street	Lot 221 DP 1013964	Local
Mayfield North	AC Saltwater Pumphouse	99 Selwyn Street	Lot 221 DP 1013964	Local
Mayfield North	Administration Building	99 Selwyn Street	Lot 221 DP 1013964	State
Mayfield North	Delprat's Quarters	99 Selwyn Street	Lot 221 DP 1013964	State
Mayfield North	DC Substation	99 Selwyn Street	Lot 221 DP 1013964	State
Mayfield North	Powerhouse	99 Selwyn Street	Lot 221 DP 1013964	Local
Mayfield North	No 4 Blast Furnace and Stoves	99 Selwyn Street	Lot 221 DP 1013964	Local
Mayfield North	Quality Control Laboratory	99 Selwyn Street	Lot 221 DP 1013964	Local
Mayfield North	BOS Plant	99 Selwyn Street	Lot 221 DP 1013964	Local
Mayfield North	Mould Conditioning Building	99 Selwyn Street	Lot 221 DP 1013964	Local
Mayfield North	Master Mechanics Office	99 Selwyn Street	Lot 221 DP 1013964	Local
Mayfield North	Pattern Store	99 Selwyn Street	Lot 221 DP 1013964	Local
Mayfield North	Remnant No 1 Blast Furnace	99 Selwyn Street	Lot 221 DP 1013964	State

Mayfield North	Open Hearth Change House	99 Selwyn Street	Lot 221 DP 1013964	Local
Mayfield North	Tool Room	99 Selwyn Street	Lot 221 DP 1013964	Local
Mayfield North	Steel Foundry	99 Selwyn Street	Lot 221 DP 1013964	State
Mayfield North	18" Mill Building and Stack Yard	99 Selwyn Street	Lot 221 DP 1013964	State
Mayfield North	12" Mill Building and Stack Yard	99 Selwyn Street	Lot 221 DP 1013964	State
Mayfield North	No 1 Rod Mill Building	99 Selwyn Street	Lot 221 DP 1013964	State
Mayfield North	Open Hearth Building	99 Selwyn Street	Lot 221 DP 1013964	State
Mayfield North	Original Timber Wharves	99 Selwyn Street	Lot 221 DP 1013964	State
Mayfield West	Former Maternity Hospital	1 Buruda Street	Lot 2 DP 156246	Local
Mayfield West	Mayfield West Public School	7 Gregson Avenue	Lot 1 DP 795155	Local
Mayfield West	Former Migrant Camp	609 Maitland Road	Lot 1 DP 369641	State
Mayfield West	Substation	2 Maud Street	Lot 4 DP 153265	Local
Mayfield West	Remnant Garden	50 McIntosh Drive	Lot 23 DP 270249	Local
Merewether	Burwood Inn	77 Berner Street	Lot 1 DP 79791	Local
Merewether	Merewether Baby Health Clinic	25 Caldwell Street	Lot 1 DP 1103114	Local
Merewether	Former Glebe Methodist Church	101 City Road	Lots 33 and 34 Sec 7 DP 111240	Local
Merewether	Residence	1A Curry Street	Lot 1 DP 866521	Local
Merewether	Former Racecourse Inn	65 Frederick Street	Lot 200 DP 882970	Local
Merewether	Trialba (Residence)	75 Frederick Street	Lot A DP 155296	Local
Merewether	Beach Hotel	99 Frederick Street	Lot 1 DP 79757	Local
Merewether	Stallards Garage	152 Glebe Road	Lot 1 DP 998577	Local
Merewether	Merewether Uniting Church	176 Glebe Road	Lots 78–80 Sec 6 DP 32615	Local
Merewether	Beach Pavilion	5 Henderson Parade	Lot 100 DP 1130581	Local
Merewether	Merewether Baths	27 Henderson Parade	R 56681	Local
Merewether	The Ridge (Hillcrest Hospital)	21 Hillcrest Road	Lot 5 DP 260947	State
Merewether	Brown Sisters' Convent	8 Janet Street	Lot 1 DP 210515	Local
Merewether	Holy Family Parish Hall	19 Janet Street (Ridge Street)	Lot 1 DP 547032	Local
Merewether	Residence	8 Kempster Road	Lots 90 and 91 DP 1082365	Local
Merewether	Brynhfryd (Residence)	44 Kilgour Avenue	Lot 1 DP 986437	Local
Merewether	Merewether Post Office	36 Llewellyn Street	Lot 152 DP 772098	Local
Merewether	Merewether Fire Station	37 Llewellyn Street	Lot 1100 DP 997536, Lots 111 and 112 DP 530198	Local
Merewether	St Augustine's Anglican Church	43 Llewellyn Street	Lots 7–9 Sec 6 DP 111239	Local
Merewether	Former Police Station	85 Llewellyn Street	Lot 101 DP 829724	Local

Merewether	Blairgowrie (Residence)	39 Lloyd Street	Lot 1 DP 514500	Local
Merewether	Henderson Park Community Hall	42 Lockyer Street	Pt Lot 199 Sec B DP 109967	Local
Merewether	Henderson Park	42 Lockyer Street	Lot 199 Sec B DP 109967	Local
Merewether	Macquarie Street Reservoir	65 Macquarie Street	Lot 10 DP 813829	Local
Merewether	Remnant Metrosideros Plantings	Memorial Drive		Local
Merewether	Remains of Glenrock Railway	Merewether Beach	R 46525	Local
Merewether	War Memorial (Mitchell Park)	24 Mitchell Street	Lot 7022 DP 93962	Local
Merewether	Townson Oval Pavilion (Mitchell Park)	24 Mitchell Street	Lot 7022 DP 93962	Local
Merewether	Merewether Baptist Church	75 Morgan Street	Lot 3 DP 153084	Local
Merewether	Residence	26 Rowan Crescent	Lot 91 DP 521593	Local
Merewether	Remains of Smelter	Smelters Beach		Local
Merewether	Newcastle Coke Ovens	80 Watkins Street		Local
Merewether Heights	Fruit Packing Shed and Residence	221 Scenic Drive	Lot 1 DP 197754	Local
Merewether Heights	Glenrock Reserve	221 Scenic Drive	Lots 111 and 112 DP 776284, Lot 110 DP 571225, Lot 7 DP 520646, Lot 1 DP 733514, Lot 1 DP 197754	Local
Merewether Heights	Bailey's Orchard	221 Scenic Drive	Lot 1 DP 197754, Lot 1 DP 73351, Lot 111 DP 776284	Local
Minmi	Duckenfield Colliery Railway (Relics)			Local
Minmi	Duckenfield Railway No 1 Colliery Branch Line			Local
Minmi	Duckenfield Railway Nos 2, 3 and 4 Collieries Branch Line			Local
Minmi	St Andrews Presbyterian Church	19 Church Street	Lot 1 DP 577710	Local
Minmi	Former Police Station and Courthouse	40 Church Street	Lot 1 DP 730659	Local
Minmi	John Brown's Model Farm	33 Lenaghans Drive		Local
Minmi	Stone Ford	33 Lenaghans Drive	Lot 1 DP 1007615	Local
Minmi	Winston Court (Residence)	142 Lenaghans Drive	Pt Lot 4 DP 850020	Local
Minmi	Former Railway Cuttings	East of McInnes Street	Pt Lot 12 DP 1022524	Local
Minmi	Minmi to Hexham Railway	Minmi to Hexham		State
Minmi	Cemetery	141 Minmi Road	Lot 34 DP 800036	Local

Minmi	Duckenfield No. 2 Colliery Air Furnace Shaft	141 Minmi Road	Lot 34 DP 800036	Local
Minmi	Minmi Reservoir Site	15 Reservoir Road	Lot 147 DP 840897	Local
Minmi	Former Reservoir Residence	17 Reservoir Road	Lot 21 DP 793953	Local
Minmi	Remains of Railway Siding	29 Woodford Street	Lot 148 DP 840897	Local
Minmi	Dairy Cool Rooms	29 Woodford Street	Lot 148 DP 840897	Local
Minmi	Former Railway Cuttings	29 Woodford Street	Lot 148 DP 840897	State
Minmi	Minmi Public School (Foundation stones and bell)	56 Woodford Street	Lot 1 DP 782483, Lot 15 Sec A DP 30399	Local
Minmi	Minmi Coal Carriage	56 Woodford Street	Lot 1 DP 782483, Lot 15 Sec A DP 30399	Local
Minmi	Minmi Train Carriage	96 Woodford Street	Lot 1 DP 157344	Local
Minmi	Former Post Office	129 Woodford Street	Lot 1 DP 446269	Local
Minmi	Minmi Hotel	156 Woodford Street	Lot 2 DP 851653	Local
Minmi	Garden House Site	177 Woodford Street	Lot 2 DP 1029922	Local
Minmi	Former Minmi Public School and Residence	196 Woodford Street	Lots 11 and 12 DP 596179	Local
New Lambton	Former Savoy Theatre	18A and 18B Alma Road	Lot 1266 DP 755247	Local
New Lambton	Newbold House	161 Croudace Street	Lots 3 and 4 DP 17908	Local
New Lambton	New Lambton Scout Hall	4 Fleet Street	Lot 6 DP 20700, Lot 10 DP 14496	Local
New Lambton	Scottish Australian Mining Co (site)	1A Mahogany Drive	Lot 19 DP 555035	Local
New Lambton	New Lambton Substation	34A Portland Place	Lot 310 DP 713570	Local
New Lambton	Orielton (Residence)	41 Queens Road	Lot C DP 315885	Local
New Lambton	The Grange (Residence)	59 Queens Road	Lot 2 DP 547000	Local
New Lambton	New Lambton Public School	66 Regent Street	Pt Lot 1220 DP 755247, Lot 1 DP 122485, Lots 1215, 1216 and 1218 DP 122486, Lot 1224 DP 755247	Local
New Lambton	St Therese Primary School	39 Royal Street	Lots 67–69 DP 5401	Local
New Lambton	Former Police Station and Residence	23 Westcourt Road	Lot 1223 DP 755247	Local
New Lambton Heights	Rankin Park Hospital	2 Lookout Road	Lot 13 DP 876245	Local
New Lambton Heights	Croudace House	2 Lookout Road	Lot 13 DP 876245	Local
New Lambton Heights	Remnant Garden, Croudace House	2, 14 and 20 Lookout Road	Lot 13 DP 876245, SP 60845, Lot 12 DP 876245	Local
Newcastle	Newcastle Post Office Annex	5 Bolton Street	Lot 1 DP 430746	State
Newcastle	NZ Insurance Building	12 Bolton Street	SP 51662	Local

Newcastle	Union Trustee Building	18 Bolton Street	Lot 42 DP 542509	Local
Newcastle	Former Eldon Chambers	24 Bolton Street	Lot 2 DP 136640	Local
Newcastle	Court Chambers	40 Bolton Street	Lot 71 DP 541527	Local
Newcastle	Steels Garage (Former Olympic Hall)	47 Bolton Street	Lot 1 DP 74337	Local
Newcastle	Former David Cohen & Co Warehouse	50 Bolton Street	Lot 1 DP 601267	State
Newcastle	Toll Cottage (Former Rose Cottage)	51 Bolton Street	Lot 394 DP 747410	State
Newcastle	Former Newcastle East Public School	58 Bolton Street	Lot 1 DP 709455	Local
Newcastle	Customs House	1 Bond Street	Lot 1 DP 533984	State
Newcastle	Stanton Catchlove Bond Store	11 Bond Street	Lot 1 DP 619238	Local
Newcastle	Macquarie House	8 Church Street	Lot 10 DP 24188	State
Newcastle	Courthouse	9 Church Street	Pt DP 755247	State
Newcastle	Buchanan Terrace and footpath	10 Church Street	Lot 9 DP 24188	State
Newcastle	Buchanan Terrace and footpath	12 Church Street	Lot 8 DP 24188	State
Newcastle	Buchanan Terrace and footpath	14 Church Street	Lot 7 DP 24188	State
Newcastle	Buchanan Terrace and footpath	16 Church Street	Lot 6 DP 24188	State
Newcastle	Buchanan Terrace and footpath	18 Church Street	Lot 5 DP 24188	State
Newcastle	Buchanan Terrace and footpath	20 Church Street	Lot 4 DP 24188	State
Newcastle	Buchanan Terrace and footpath	22 Church Street	Lot 3 DP 24188	State
Newcastle	Buchanan Terrace and footpath	24 Church Street	Lot 2 DP 24188	State
Newcastle	Buchanan Terrace and footpath	26 Church Street	Lot 1 DP 24188	State
Newcastle	Buchanan Terrace and footpath	28 Church Street	Lot B DP 420090	State
Newcastle	Buchanan Terrace and footpath	30 Church Street	Lot A DP 420090	State
Newcastle	Grand Hotel	32 Church Street	Lot 32 DP 343633	State
Newcastle	Dwelling	46 Church Street	Lot A DP 331216	Local
Newcastle	Nos 1 and 2 Lee Wharf Buildings A and C	9 Honeysuckle Drive	Pt Lot 51 DP 1036132	State
Newcastle	Civic Railway Workshops Group	9 Honeysuckle Drive, 10A Merewether Street	Pt Lot 51 DP 1036132, Lot 50 DP 1036132	State
Newcastle	T & G Mutual Life Assurance Building	45 Hunter Street	Lot 6 DP 75385	State
Newcastle	Sun Building (Facade only)	48–56 Hunter Street	Lot 4 DP 76454	Local
Newcastle	AMP Building	55 Hunter Street	SP 53607	State
Newcastle	Former CBA Bank	67 Hunter Street	SP 65329	Local

Newcastle	Former National Bank	68 Hunter Street	Lot 1 DP 66499	Local
Newcastle	National Australia Bank	73 Hunter Street	Lot A DP 60510	State
Newcastle	Former Department of Public Works Office	74 Hunter Street	Lot 3224 DP 729951	State
Newcastle	Former Emporium Building	87–89 Hunter Street	Lots 1 and 2 DP 152682	Local
Newcastle	Former Police Station	90 Hunter Street	Lot 3223 DP 729951	State
Newcastle	Post Office and War Memorial Statue	96–100 Hunter Street	Lot 103 DP 758769	State
Newcastle	ANZ Bank	102 Hunter Street	Lot 1 DP 131741	State
Newcastle	CML Building	108–112 Hunter Street	Lot 1 DP 331485	State
Newcastle	Municipal Building	122–132 Hunter Street	Lots A–F DP 80153	Local
Newcastle	Former Hotel Hunter	154 Hunter Street	Lot 2 DP 600274	Local
Newcastle	Municipal Building	164–170 Hunter Street	Lot 1 DP 600274	Local
Newcastle	David Jones (Commercial building)	169–185 Hunter Street	Lot 1 DP 749729	Local
Newcastle	Former A A Dangar Building	176 Hunter Street	Lot 1 DP 110615	Local
Newcastle	Former School of Arts	182 Hunter Street	Lot 212 DP 660080	Local
Newcastle	Crown & Anchor Hotel	189 Hunter Street	Lot 1 DP 79759	Local
Newcastle	Former Johns Building	200–212 Hunter Street	Lot 1 DP 228072	Local
Newcastle	Commonwealth Bank Building	220 Hunter Street	Lot 1 DP 78033	Local
Newcastle	Former ANZ Bank	227 Hunter Street	Lot 1 DP 770692	Local
Newcastle	Lucky Country Hotel	237 Hunter Street	Lots 1 and 2 DP 331728	Local
Newcastle	Former Tramway Substation	342 Hunter Street	SP 21188	Local
Newcastle	Former Frederick Ash Building	357 Hunter Street	Lot 2 DP 1010675	Local
Newcastle	Civic Theatre	373 Hunter Street	Pt Lot 1 DP 225689	State
Newcastle	Former Emporium Building	517–529 Hunter Street	Lot 801 DP 562199	Local
Newcastle	Former Police Station	558 Hunter Street	Lot 3195 DP 705450	Local
Newcastle	Wheeler House	8 King Street	SP 65842	Local
Newcastle	Ireland Bond Store	123 King Street	Lot 1 DP 64187	Local
Newcastle	Albert Terraces	164–176 King Street	Lots 1–5 DP 263453	Local
Newcastle	The Moorings (Residential units)	199 King Street	SP 2831	Local
Newcastle	Civic Park	201 King Street	Lot 300 DP 604071	Local
Newcastle	Church Walk Park	203 King Street	Lot 27 DP 150538	Local
Newcastle	City Hall and lamp posts	290 King Street	Pt Lot 1 DP 225689	State
Newcastle	Christie Place (including fountain)	292 King Street	Pt Lot 1 DP 225689	Local
Newcastle	Nesca House	300 King Street	Lot 2 DP 225689	State

Newcastle	Newcastle War Memorial Cultural Centre	1 Laman Street		State
Newcastle	The Newcastle Club	40 Newcomen Street	Lots 1 and 2 DP 997519	State
Newcastle	Claremont (Former residence)	40 Newcomen Street	Lot 2 DP 997519	State
Newcastle	Sunnyside (Residence)	44 Newcomen Street	Lot 41 DP 1060945	Local
Newcastle	Terrace House	49 Newcomen Street	Lot 61 DP 569796	Local
Newcastle	Newcomen House (Residence)	51 Newcomen Street	Lot 1 DP 794738	Local
Newcastle	Newcastle Hospital North Wing	21 Pacific Street	Lot 22 DP 880526	State
Newcastle	Former Nurses Home	30 Pacific Street	Lot 100 DP 883220	Local
Newcastle	Former Victoria Theatre	8–10 Perkins Street	Lot 1 DP 1005699	State
Newcastle	Miss Chippendale's School Room	45 Perkins Street	Lot 1 DP 1034041	Local
Newcastle	House	49 Perkins Street	Lot 1 DP 854928	Local
Newcastle	Former Superintendent's Residence	88 Scott Street	Lot 3211 DP 722246	State
Newcastle	Former Coutts Sailor Home	88 Scott Street (facing Bond Street)	Lot 3211 DP 722246	State
Newcastle	Great Northern Hotel	89 Scott Street	Lot 100 DP 834251	State
Newcastle	Former Residence	90 Scott Street	Lot 1 DP 123946	Local
Newcastle	Convict Lumber Yard—Stockade Site	92 Scott Street	Pt Lot 2 DP 706760, Lot 3214 DP 729000	State
Newcastle	Station Master's Residence	92 Scott Street	Pt Lot 2 DP 706760	Local
Newcastle	Former Station Master's Residence	92 Scott Street	Pt Lot 2 DP 706760	State
Newcastle	Former Railway Pay Office	92 Scott Street (facing Bond Street)	Pt Lot 2 DP 706760	State
Newcastle	Newcastle Railway Station	110 Scott Street	Lot 8 DP 720672	State
Newcastle	Centennial Hotel	127 Scott and 114 Hunter Streets	Lots 1 and 2 DP 745997	Local
Newcastle	Air Force Club (Wood Chambers)	129 Scott Street	Lot 1 DP 996093	State
Newcastle	Rundles Buildings (Former R Hall & Sons)	161 Scott Street	SP 57218	Local
Newcastle	Former Beberfaulds Warehouse	175 Scott Street	SP 35541, SP 37388	Local
Newcastle	Shepherds Hill Group (includes residence, observation post and gun placement)	41 The Terrace	Lot 3116 DP 755247	State
Newcastle	Howard Smith Chambers	14 Watt Street	SP 16024	Local
Newcastle	Manufacturers House	35–37 Watt Street	Lot 1 DP 342578	State
Newcastle	St Phillips Church	48 Watt Street	Lot 38 DP 54152	Local
Newcastle	Watt Street Terrace	50 Watt Street	Lot 12 DP 24188	State
Newcastle	Watt Street Terrace	52 Watt Street	Lot 13 DP 24188	State
Newcastle	Watt Street Terrace	54 Watt Street	Lot 14 DP 24188	State

Newcastle	United Services Club	55 Watt Street	Lot 2 DP 609103	Local
Newcastle	Watt Street Terrace	56 Watt Street	Lot 15 DP 24188	State
Newcastle	Watt Street Terrace	58 Watt Street	Lot 16 DP 24188	State
Newcastle	Watt Street Terrace	60 Watt Street	Lot 17 DP 24188	State
Newcastle	Watt Street Terrace	62 Watt Street	Lot 18 DP 24188	State
Newcastle	Former Military Hospital	72 Watt Street	Pt DP 755247	State
Newcastle	Former Barracks	72 Watt Street	Pt DP 755247	State
Newcastle	Fletcher Monument	75 Watt Street	Ms 1135 Md	Local
Newcastle	Argyle House	311 Wharf Road	Lot 190 DP 541370	State
Newcastle	Retaining walls with sandstone steps	Wolfe Street		Local
Newcastle	Segenhoe (Residential units)	50 Wolfe Street	SP 19837	Local
Newcastle East	Nobbys Lighthouse, headland and breakwater	Nobbys Road		
Newcastle East	Fort Scratchely group (Buildings and underground forts)	31 Nobbys Road	Lot 1 DP 407886	State
Newcastle East	Nobbys Beach Pavilion	35 Nobbys Road	Pt R 88721	Local
Newcastle East	Boatmans Terrace group (Residences)	36–66 Nobbys Road	Lot 1 DP 617504	Local
Newcastle East	Column from original Courthouse	Parnell Place	Pt N 137–844R	Local
Newcastle East	Coal Memorial	Parnell Place	Pt N 137–844R	Local
Newcastle East	The Retreat (Residence)	31 Parnell Place	Lot 4 DP 4296	Local
Newcastle East	The Carlton (Residential units)	19 Scott Street	SP 39163	Local
Newcastle East	Former Newcastle East Police Station	63 Scott Street	Lot 328 DP 758769	State
Newcastle East	Soldiers Baths	Shortland Esplanade		State
Newcastle East	Ocean Baths	30 Shortland Esplanade	Pt Ms 1133 Md	Local
Newcastle East	Stevenson Place Precinct (Terraces)	1–55 Stevenson Place		Local
Newcastle East	Former John Bull Warehouse	28 Stevenson Place	SP 48754	Local
Newcastle East	Former Earp Gillam Bond Store	16 Telford Street	SP 44807	State
Newcastle East	Tyrrell House (Facade only)	49 Telford Street	SP 20749	Local
Newcastle East	Stone Boat Harbour (Relic)	48 Wharf Road	Pt Lot 52 DP 791037	State
Newcastle West	Former City Bank	553–557 Hunter Street	Lots A and B DP 162398	Local
Newcastle West	Former CBC Bank	559 Hunter Street	Lot 941 DP 997920	Local
Newcastle West	Newcastle Technical College	590–608 Hunter Street	Lots 1 and 2 DP 852552	State
Newcastle West	Hunter Water Board Building	599 Hunter Street	Lot 1 DP 595677	Local
Newcastle West	Theatre Royale	669 Hunter Street	Lot 111 DP 75158	State
Newcastle West	Palais Royale	684 Hunter Street	Lot 11 DP 872463	Local
Newcastle West	Bellevue Hotel	738 Hunter Street	Lot 8 DP 1008628	Local

Newcastle West	Bank Corner (Former Bank of NSW)	744 Hunter Street	Lot 1 DP 75008, Lot 1 DP 196241	Local
Newcastle West	Regional Museum	787 Hunter Street	Lot 21 DP 774313	State
Newcastle West	St Josephs Convent and Sacred Heart Church and School	841 Hunter Street	Lot 2 DP 787816, Lot 1 DP 129569, Lots 38 and 39 DP 95306, Lot 1 DP 95139	Local
Newcastle West	Former Newcastle Co -operative Store	854 Hunter Street	Lot 1 DP 82517	Local
Newcastle West	Dairy Farmers Building	924 Hunter Street	Lot 2 DP 445736	Local
Newcastle West	Miss Porter's Residence	434 King Street	Lot 441 DP 998073	State
Newcastle West	Army Drill Hall	498 King Street	Lot 1 DP 222839	Local
Newcastle West	Birdwood Park	502 King Street	Pt Lots 112–118 DP 95185	Local
Newcastle West	Hamilton College of TAFE	91 Parry Street	Lot 1 DP 584429	Local
Newcastle West	Former Gasworks Office	18 Steel Street	Lot 1 DP 797175	Local
North Lambton	Residence	288 Newcastle Road	Lot 181 DP 561160	Local
North Lambton	Residence	298 Newcastle Road	Lot 101 DP 587293	Local
North Lambton	Former Reservoir Hotel	330 Newcastle Road	Lot 28 Sec B DP 1700	Local
North Lambton	Former Red Lion Hotel	414 Newcastle Road	Lot 2 DP 405066	Local
North Lambton	Quarrymans Cottage	15 Percy Street	Lot 15 Sec C DP 96	Local
Sandgate	Sandgate Cemetery	108 Maitland Road	Pt DP 755247	Local
Sandgate	Sandgate Cemetery Railway Spur	108 Maitland Road		Local
Sandgate	Sandgate Cemetery Office	116 Maitland Road	Lot 2913 DP 755247	Local
Sandgate	2HD Studio	173 Maitland Road	Pt Lots 36 and 37 DP 37259, Lot 1 DP 783568, Lot 1 DP 997590	Local
Shortland	Uniting Church	272 Sandgate Road	Lot 100 DP 705646	Local
Stockton	St Pauls Anglican Church Group	2 Church Street	Pt Lot 1 DP 60307	Local
Stockton	Stockton Public School	10 Clyde Street	Lots 10 and 11 Sec 22 DP 753191, Lot 101 Sec 22 DP 192889, Lot 110 DP 821006	Local
Stockton	Mine Disaster Memorial	Cnr Clyde and Mitchell Streets		Local
Stockton	Former Sister Ogden's Hospital	29 Crown Street	Lots 14 and 15 Sec A DP 6865	Local
Stockton	Stockton Horse Trough	Douglas Street		Local
Stockton	St Peter in Chains Hall	1–5 Dunbar Street	Lot 1 Sec S DP 984043, Lots 19–21 Sec B DP 6865	Local
Stockton	St Peter in Chains Presbytery	7 Dunbar Street	Lot 1 DP 840256	Local
Stockton	Stockton Centre	342 Fullerton Road	Lot 430 DP 835921	Local

Stockton	Former Locomotive Ash Pit	Fullerton Street		Local
Stockton	Prawners Slipway	Fullerton Street		Local
Stockton	Boat Harbour (Place)	Fullerton Street		Local
Stockton	The Laurels (Residence)	48 Fullerton Street	Lot 1 DP 731739	Local
Stockton	Former Callen Residence	118 Fullerton Street	Lot A DP 314946	Local
Stockton	Boatrowers Hotel	130A Fullerton Street	Lot 6 Sec 10 DP 192889	Local
Stockton	Copse of Acacia Karroo (trees)	201 Fullerton Street	Lot 1 DP 529611	Local
Stockton	The Ballast Ground (Place)	Fullerton Street and Wharf Crescent		Local
Stockton	Stockton Fire Station	36 Hereford Street	Lot 15 Sec 12 DP 753191	Local
Stockton	St Giles Presbyterian Church	91 Hereford Street	Lot 1 DP 1000364	Local
Stockton	Former St Paul's Rectory	32 Maitland Street	Lot 1 DP 343745	Local
Stockton	General Washington Hotel	1 Mitchell Street	Lot 1 DP 82959, Lots 58 and 59 DP 753191	Local
Stockton	Former Savoy Picture Theatre	68 Mitchell Street	Lot 51 DP 617372	Local
Stockton	Beach Cafe	115 Mitchell Street	Lot 1 DP 949659	Local
Stockton	Residence	121–123 Mitchell Street	Lot 7 Sec 23 DP 192889	Local
Stockton	The John Slade Memorial Pavilion	124 Mitchell Street	R 79066	Local
Stockton	War Memorial	124 Mitchell Street	Closed Road—(R 79066)	Local
Stockton	Former Sister Brown's Residence	139 Mitchell Street	Lot 1 DP 323545	Local
Stockton	Ocean View Flats	179 Mitchell Street	Lot 201 DP 614477	Local
Stockton	Former Police Station/Residence	1A Newcastle Street	Pt Lot 4 DP 213040	Local
Stockton	Wreck of Adolphe	Pitt Street	Off Breakwater	Local
Stockton	Residence	1 Queen Street	Lot 1 DP 799919	Local
Tarro	Tarro Substation	6A Anderson Drive	Lot 1 DP 701060	Local
Tarro	Our Lady of Lourdes Church	42 Anderson Drive	Pt Lot 59 DP 755205	Local
Tarro	Residence	29 Eastern Avenue	Lot 100 DP 849413	Local
Tarro	Tarro Community Hall	2A Northern Avenue	Lot 3 Sec F DP 13126	Local
Tarro	Pumping Station	3 Woodberry Road	Lot 2 DP 595526	Local
Tarro	Substation	3 Woodberry Road	Lot 2 DP 595526	Local
The Hill	Shalamah (Residence)	4 Barker Street	Lots 1 and 2 DP 195186	Local
The Hill	Jesmond House (Residence)	10 Barker street	Lots A and B DP 153708	Local
The Hill	Captain Allan's House	19 Barker Street	Lot 343 DP 54152	Local
The Hill	St Ronans (Residence)	18 Bingle Street	Lot B DP 420523	State

The Hill	Bishopscourt (Residence)	34 Brown Street	Lot 102 DP 1020129	Local
The Hill	Newcastle East Public School	48 Brown Street	Lots 1–3 DP 794850	Local
The Hill	Newcastle Hill Reservoir	51 Brown Street	Lots 346 and 347 DP 758769, Lot 312 DP 54152, Lot 314 DP 54152	Local
The Hill	Marlborough House	49 Church Street	Lot 1 DP 819070	Local
The Hill	Woodlands (Residence)	51 Church Street	Lot 11 DP 634172	State
The Hill	Gate and Stairs	52 Church Street	Lot 1 DP 594939	Local
The Hill	Christchurch Cathedral	52A Church Street	Lot 3 DP 36886	State
The Hill	Lance Villa group terrace house	66 Church Street	Lot 61 DP 585966	Local
The Hill	Lance Villa group terrace house	68 Church Street	Lot 62 DP 585966	Local
The Hill	Lance Villa group terrace house	70 Church Street	Lot 161 DP 54152	Local
The Hill	Lance Villa group terrace house	72 Church Street	Lot 1 DP 770143	Local
The Hill	Lance Villa group terrace house	74 Church Street	Lot 611 DP 996843	Local
The Hill	Lance Villa group terrace house	76 Church Street	Lot 1 DP 852881	Local
The Hill	Lance Villa group terrace house	78 Church Street	Lot 1620 DP 817037	Local
The Hill	Minumbah (Residence)	88 Church Street	Lot 1 DP 743943	Local
The Hill	Cliff Towers (Residential units)	124 Church Street	SP 1533	Local
The Hill	The Boltons (Residence)	1 off Church Street	Lot 4 DP 37425	Local
The Hill	The Boltons (Residence)	2 off Church Street	Lot 5 DP 37425	Local
The Hill	The Boltons (Residence)	3 off Church Street	Lot 6 DP 37425	Local
The Hill	The Boltons (Residence)	4 off Church Street	Lot 7 DP 37425	Local
The Hill	Dr Richard Harris' Residence	81 King Street	Lot 1 DP 63392	Local
The Hill	Cathedral Park and Cemetery	93 King Street	Lot 1 DP 36886	State
The Hill	Christchurch Parish Hall	60 Newcomen Street	Lot 1 DP 198891	State
The Hill	Newcastle Grammar School— Berkeley House Building	60 Newcomen Street	Lot 1 DP 198891	Local
The Hill	Newcastle Grammar School— Merrick House Building	60 Newcomen Street	Lot 1 DP 198891	Local
The Hill	King Edward Park Group (includes public reserve, drinking fountain and rotunda)	3 Ordnance Street	Pt DP 54152	State

The Hill	King Edward Park Group (Bogey Hole) Public Baths	3 Ordnance Street	Pt DP 54152	State
The Hill	Obelisk	3 Ordnance Street	Pt DP 54152	Local
The Hill	St Mary's Star of Sea Church	54 Perkins Street	Lot 103 DP 713990	Local
The Hill	Residence	56 Perkins Street	Lot 104 DP 713990	Local
The Hill	House	58 Perkins Street	Lot 1 DP 996157	Local
The Hill	Terrace	60 Perkins Street	Lot 1 DP 712325	Local
The Hill	Terrace	62 Perkins Street	Lot 1 DP 731703	Local
The Hill	Terrace	64 Perkins Street	Lot 1 DP 783710	Local
The Hill	Three Storey House (also known as Corlette's Cottage)	2 The Terrace	Lot 1 DP 198906	Local
The Hill	Terrace (Pacific House)	4 The Terrace	Pt Lots 14 and 15 Sec Q DP 978941	Local
The Hill	House	6 The Terrace	Lot B	Local
The Hill	Terrace	8 The Terrace	Pt Lot 13 Sec Q DP 978941	Local
The Hill	Terrace	10 The Terrace	Pt Lot 13 Sec Q DP 978941	Local
The Hill	Terrace	12 The Terrace	Lots 1 and 2 DP 193906	Local
The Hill	Terrace	14 The Terrace	Lot 1 DP 136805	Local
The Hill	Terrace	16 The Terrace	Lot 11 Sec Q DP 978941	Local
The Hill	Terrace	20 The Terrace	Lots 5 and 6 DP 732782	Local
The Hill	Terrace	22 The Terrace	Lot 1 DP 986478	Local
The Hill	Terrace	24 The Terrace	Lot 1 DP 198415	Local
The Hill	Terrace	26 The Terrace	Lot 8 DP 742527	Local
The Hill	Terrace	28 The Terrace	Lot 7 Sec Q DP 978941	Local
The Hill	Terrace	30 The Terrace	Lot 1 DP 198361	Local
The Hill	Terrace	32 The Terrace	Lot 100 DP 809379	Local
The Hill	Terrace	38 The Terrace	Lot 1 DP 112366	Local
The Hill	Terrace House (Hill House)	40 The Terrace	Lot 1 DP 735348	Local
The Hill	Hillside (Residence)	24 Tyrrell Street	Lot 1 DP 197834	Local
The Hill	Former Stables	8/60 Tyrrell Street	Lot 53 SP 69660	Local
The Hill	Beacon Tower (Landmark)	76 Tyrrell Street (cnr Brown and Tyrrell Streets)	Lot 102 DP 1020129	Local
The Junction	Brien Street Terraces	6–14 Brien Street	Lot 1 DP 741600, Lot 1 DP 799556, Lot 1 DP 996600, Lot 1 DP 743276, Lot 1 DP 798066	Local
The Junction	Farquhar Street Terraces	3–9 Farquhar Street	Pt Lot 9, Lot 1 DP 112625, Lot 1 DP 797573	Local
The Junction	Residence	26 Farquhar Street	Lot 80 DP 95001	Local
The Junction	Former Primitive Methodist Parsonage	28 Farquhar Street	Lot 81 DP 95001	Local
The Junction	Rowland Park War Memorial	77A Glebe Road	Lot 108 DP 95290	Local
The Junction	Rowland Park	77A Glebe Road	Lot 108 DP 95290	Local

The Junction	Rowland Park Fountain	77A Glebe Road	Lot 108 DP 95290	Local
The Junction	War Memorial	Kenrick Street		Local
The Junction	St Joseph's Convent and School Group (incorporating St Thomas More Centre)	34 Kenrick Street	Pt Lot 38 and Lots 39, 40 and 43–50 Sec N DP 978941	Local
The Junction	The Junction Primary School	2 Watkins Street	Lots 1–8 DP 795234, Lot 1 DP 592431, Lot 1 DP 159535, Lot 1 DP 164214	Local
Tighes Hill	Tighes Hill School of Arts	15 Elizabeth Street	Lot 12 Sec E DP 230	Local
Tighes Hill	Tighes Hill Public School	33 Elizabeth Street	Lots 7–14 Sec F DP 61, Lot 1 DP 795035	Local
Tighes Hill	Former Police Lock-up	66 Elizabeth Street	Lots 4 and 5 Sec C DP 454	Local
Tighes Hill	Royal Oak Hotel	207 Maitland Road	Lot 1 DP 513115	Local
Tighes Hill	Tighes Hill TAFE College	266 Maitland Road	Lot 100 DP 1004331	Local
Tighes Hill	Immaculate Heart of Mary Church	16 Tighes Terrace	Lot 2 DP 578946	Local
Tighes Hill	Convent of Mercy	38 Union Street	Lots 29 and 30 DP 32507	Local
Wallsend	Federal Park	2 Boscawen Street	Ms 818 Md	Local
Wallsend	RM Evans Funeral Chapel	5 Bunn Street	Lot 1 DP 779152	Local
Wallsend	Clarens House	4 Campbell Street	Lot 1 DP 795472	Local
Wallsend	Clarke Street Cottages	32–34 Clarke Street	Lot 1 Sec E DP 799569, Lot 9 DP 977871	Local
Wallsend	Former School of Arts (Fellowship House)	69 Cowper Street	Lot 1 DP 709819	Local
Wallsend	Railway Goods Shed	76 Cowper Street	Lot 27 DP 598215	State
Wallsend	Terminus Hotel	77 Cowper Street	Lot 1 DP 75085	Local
Wallsend	Stables	81 Cowper Street	Lot 30 DP 625168	Local
Wallsend	Colliery Inn	87 Cowper Street	Lot 1 DP 76381	Local
Wallsend	Wallsend Fire Station	27 Devon Street	Lot 1 DP 78016	Local
Wallsend	Wallsend Precinct—Courthouse	18 Harris Street	Lot 1 DP 199628	Local
Wallsend	Former Grapes Inn	20 Kemp Street	Lot 52 DP 529189	Local
Wallsend	Wallsend Park	47 Lake Road	Pt Lot 1 DP 724075	Local
Wallsend	Woodlands House	100 Lake Road	Lot 1 DP 337878	Local
Wallsend	Wallsend Hospital Median Garden	Longworth Avenue		Local
Wallsend	Wallsend Drug and Alcohol Centre	10 Longworth Avenue	Lots C–F DP 312480, Lot 1 DP 315099	Local
Wallsend	Wallsend Hospital	10 Longworth Avenue	Lots C–F DP 312480, Lot 1 DP 315099	Local
Wallsend	Wallsend Masonic Hall	4 Metcalfe Street	Lot 1 DP 1037615	Local

Wallsend	Newcastle Muslim Association (Building)	6 Metcalfe Street	Lot 1 DP 795032	Local
Wallsend	St Lukes Anglican Church	22 Metcalfe Street	Lot 1 Sec 3 DP 29	Local
Wallsend	Wallsend Public School	67 Metcalfe Street	Lots 1–4 DP 122513, Lot 1 DP 122511, Lot 9 Sec 15 DP 29, Lots 11 14 Sec 15 DP 29, Lots 2 and 3 DP 529635, Lots 2 and 3 DP 533593	Local
Wallsend	Racecourse Hotel	11 Minmi Road	Lot 1 DP 76498	Local
Wallsend	Lemon Grove Hotel	112 Nelson Street	Lot 1 DP 87351	Local
Wallsend	St Andrews Presbyterian Church	144 Nelson Street	Pt Lot 6 Sec 16 DP 29	Local
Wallsend	Plattsburg Public School	2 Ranclaud Street	Lots 1 and 2 DP 794917	Local
Wallsend	Wallsend Precinct—Police Station	12 Tyrrell Street	Pt B DP 111245	Local
Wallsend	Wallsend Precinct—Post Office	14 Tyrrell Street	Lots 1–4 DP 724548	Local
Wallsend	Wallsend Precinct—Public Reserve (Wallsend Rotunda Park)	18 Tyrrell Street	Ms 497 Md	Local
Wallsend	Whitton Street Postal Pillar Box	Whitton Street		Local
Waratah	Waratah Police Station	96 Georgetown Road	Lot 180 DP 755247	Local
Waratah	Former Hanbury Public School group	98 Georgetown Road	Lot 58A DP 755247, Lot 3 DP 755247	Local
Waratah	Mereyulh (Residence)	38 High Street	Lot B DP 380948	Local
Waratah	Carclew (Residence)	25 Lambton Road	Lot 2 DP 339828	Local
Waratah	Corpus Christi Catholic Church	30 Lorna Street	Lots 1–4 Sec A DP 192666	Local
Waratah	Catholic Centre for Deaf Education	30 Lorna Street	Lots 1–18 Sec A DP 192666	Local
Waratah	Braeside (Residence)	37 Lorna Street	Lot 31 DP 96026	Local
Waratah	Cottage	21 Platt Street	Lot 4 DP 731746	Local
Waratah	Cottage	23 Platt Street	Lot 1 DP 136538	Local
Waratah	Waratah School of Arts	12 Station Street	Lot 252 DP 755247	Local
Waratah	Town Hall Hotel	29 Station Street	Lot 11 DP 735547	Local
Waratah	Cottage	92 Station Street	Lot A DP 155095	Local
Waratah	Former Waratah Post Office	22 Turton Road	Lot 1 DP 773179	Local
Waratah	Waratah Technology High School	26 Turton Road	Lot 2694 DP 755247, Lot 2717 DP 755247, Lot 3179 DP 755247	Local
Waratah	Former Western Suburbs Hospital	149 Turton Road	Lot 3 DP 852177	Local
Waratah	Remnant Plantings	149 Turton Road	Lot 3 DP 852177	Local
Waratah	Waratah Park and Station Street Palms	2A Young Street	Lot 3189 DP 44990	Local

Wickham	Former Wickham Town Hall	12 Albert Street	Lot 2 DP 538523	Local
Wickham	Former Council Chambers	18A Albert Street	Lot 3175 DP 755247	Local
Wickham	Hawkins Oval	22 Albert Street	Ms 4983 Md, Pt Lot 152 DP 755247, Pt Lot 166 DP 755247	Local
Wickham	Hawkins Oval Memorial	22 Albert Street	Ms 4983 Md, Pt Lot 152 DP 755247	Local
Wickham	Former Police Lock-up	25 Albert Street	Lot 12 DP 1005516	Local
Wickham	Former New Zealand Loan Co Wool Store	2/33 Annie Street	Lot 3 DP 346352	Local
Wickham	Dalgety Warehouse	49 Annie Street	Lot 2 DP 346352	Local
Wickham	Elders Warehouse	57 Annie Street	Lot 1 DP 346352	Local
Wickham	R A Ritchie & Sons & Hudson Bros Engineering (Former industrial site)	20 Greenway Street	SP 31620	Local
Wickham	Wickham Railway Station	Hannell Street	Railway land	Local
Wickham	Signal Box—Wickham	Hannell Street	Railway land	Local
Wickham	Former School of Arts	22A Hannell Street	Lot 1 DP 1009228	Local
Wickham	Wickham Public School	54 Hannell Street	Lot 1 DP 850430	Local
Wickham	Former Infants School	64 Hannell Street	Lot 3203 DP 723289	Local
Wickham	Albion Hotel	72 Hannell Street	Lot 1 DP 76135	Local
Wickham	Stella Maris Seamans Mission	102 Hannell Street	Lot A DP 386601	Local
Wickham	The Salvation Army Men's Hostel	116–120 Hannell Street	Lot 1 DP 217399, Lot 1 DP 90935	Local
Wickham	Lass O'Gowrie Hotel	14 Railway Street	Lot 1 DP 774645	Local

Part 2 Heritage conservation areas

Description	Identification on Zoning Map
Cooks Hill	Shown by a heavy black broken line and marked "Cooks Hill Heritage Conservation Area"
Hamilton Business Centre	Shown by a heavy black broken line and marked "Hamilton Business Centre Heritage Conservation Area"
Hamilton South "Garden Suburb"	Shown by a heavy black broken line and marked "Hamilton South 'Garden Suburb' Heritage Conservation Area"
Newcastle City Centre	Shown by a heavy black broken line and marked" Newcastle City Centre Heritage Conservation Area"
Newcastle East	Shown by a heavy black broken line and marked "Newcastle East Heritage Conservation Area"
The Hill	Shown by a heavy black broken line and marked "The Hill Heritage Conservation Area"

Top of page

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The Royal Bull's Head Inn

The Bulls Head Inn was built in 1847. The present building is the extension built in...

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Appendix I

Ecology Desktop Searches

Appendix I Ecology Desktop Searches

Australian Government
Department of Sustainability, Environment, Water, Population and Communities

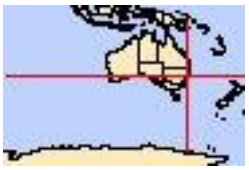
EPBC Act Protected Matters Report: Coordinates

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.environment.gov.au/epbc/assessmentsapprovals/index.html

Report created: 03/06/11 14:17:26



Summary

Details

Matters of NES
Other matters protected by the EPBC Act
Extra Information

Caveat

Acknowledgements



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 10.0Km

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance (Ramsar Wetlands):	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Threatened Ecological Communitites:	1
Threatened Species:	48
Migratory Species:	66

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.au/epbc/permits/index.html.

Commonwealth Lands:	16
Commonwealth Heritage Places:	2
Listed Marine Species:	86
Whales and Other Cetaceans:	13

Critical Habitats:	None
Commonwealth Reserves:	None

Report Summary for Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

Place on the RNE:	136
State and Territory Reserves:	5
Regional Forest Agreements:	1
Invasive Species:	17
Nationally Important Wetlands:	3

Details

Matters of National Environmental Significance

Wetlands of International Significance (RAMSAR Sites) **[Resource Information]**

Name	Proximity
Hunter estuary wetlands	Within Ramsar site

Threatened Ecological Communities **[Resource Information]**

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Threatened Species **[Resource Information]**

Name	Status	Type of Presence
BIRDS		
Anthochaera phrygia		
Regent Honeyeater [82338]	Endangered	Species or species habitat likely to occur within area
Diomedea exulans amsterdamensis		
Amsterdam Albatross [82330]	Endangered	Species or species habitat may occur within area
Diomedea exulans antipodensis		
Antipodean Albatross [82269]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans exulans		
Tristan Albatross [82337]	Endangered	Foraging, feeding or related behaviour may occur within area
Diomedea exulans gibsoni		
Gibson's Albatross [82271]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans (sensu lato)		
Wandering Albatross [1073]	Vulnerable	Species or species habitat may occur within area
Lathamus discolor		

Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
Macronectes giganteus		
Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli		
Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Pterodroma leucoptera leucoptera		
Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma neglecta neglecta		
Kermadec Petrel (western) [64450]	Vulnerable	Species or species habitat may occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri		
Buller's Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta cauta		
Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta salvini		
Salvin's Albatross [82343]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta steadi		
White-capped Albatross [82344]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris impavida		
Campbell Albatross [82449]	Vulnerable	Species or species habitat may occur within area
FROGS		
Litoria aurea		
Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat likely to occur within area
Litoria littlejohni		
Littlejohn's Tree Frog, Heath Frog [64733]	Vulnerable	Species or species habitat may occur within area
MAMMALS		
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat may occur within area
Chalinolobus dwyeri		
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat may occur within area
Dasyurus maculatus maculatus (SE mainland population)		
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat may occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus		
Long-nosed Potoroo (SE	Vulnerable	Species or species habitat may occur within area

mainland) [66645]

Pseudomys novaehollandiae

New Holland Mouse [96]	Vulnerable	Species or species habitat known to occur within area

Pteropus poliocephalus

Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area

PLANTS

Allocasuarina defungens

Dwarf Heath Casuarina [21924]	Endangered	Species or species habitat likely to occur within area

Cryptostylis hunteriana

Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area

Diuris praecox

Newcastle Doubletail [55086]	Vulnerable	Species or species habitat likely to occur within area

Eucalyptus camfieldii

Camfield's Stringybark [15460]	Vulnerable	Species or species habitat likely to occur within area

Eucalyptus parramattensis subsp. decadens

Earp's Gum, Earp's Dirty Gum [56148]	Vulnerable	Species or species habitat likely to occur within area

Melaleuca biconvexa

Biconvex Paperbark [5583]	Vulnerable	Species or species habitat known to occur within area

Persicaria elatior

Knotweed [5831]	Vulnerable	Species or species habitat likely to occur within area

Pterostylis gibbosa

Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood [4562]	Endangered	Species or species habitat may occur within area

Rulingia prostrata

Dwarf Kerrawang [13534]	Endangered	Species or species habitat likely to occur within area

Tetratheca juncea

Black-eyed Susan [21407]	Vulnerable	Species or species habitat likely to occur within area

REPTILES

Caretta caretta

Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area

Chelonia mydas

Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area

Dermochelys coriacea

Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area

Eretmochelys imbricata

Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area

Hoplocephalus bungaroides

Broad-headed Snake [1182]	Vulnerable	Species or species habitat likely to occur within area

Natator depressus		
Flatback Turtle [59257]	Vulnerable	Species or species habitat likely to occur within area
SHARKS		
Carcharias taurus (east coast population)		
Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat may occur within area
Carcharodon carcharias		
Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Pristis zijsron		
Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat may occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Migratory Species [Resource Information]

Name	Status	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba		
Great Egret, White Egret [59541]		Breeding likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Breeding likely to occur within area
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species habitat may occur within area
Diomedea amsterdamensis		
Amsterdam Albatross [64405]		Species or species habitat may occur within area
Diomedea antipodensis		
Antipodean Albatross [64458]		Species or species habitat may occur within area
Diomedea dabbenena		
Tristan Albatross [66471]		Foraging, feeding or related behaviour may occur within area
Diomedea exulans (sensu lato)		
Wandering Albatross [1073]	Vulnerable	Species or species habitat may occur within area
Diomedea gibsoni		
Gibson's Albatross [64466]		Species or species habitat may occur within area
Macronectes giganteus		
Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli		
Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Pterodroma leucoptera leucoptera		
Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Puffinus leucomelas		
Streaked Shearwater [66541]		Species or species habitat may occur within area
Sterna albifrons		
Little Tern [813]		Breeding may occur within area
Thalassarche bulleri		
Buller's Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta (sensu stricto)		
Shy Albatross, Tasmanian Shy		Species or species habitat may occur within area

Albatross [64697]		
Thalassarche impavida		
Campbell Albatross [64459]		Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini		
Salvin's Albatross [64463]		Species or species habitat may occur within area
Thalassarche steadi		
White-capped Albatross [64462]		Species or species habitat may occur within area
Migratory Marine Species		
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat may occur within area
Caperea marginata		
Pygmy Right Whale [39]		Species or species habitat may occur within area
Carcharodon carcharias		
Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Lagenorhynchus obscurus		
Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Species or species habitat likely to occur within area
Orcinus orca		
Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus		
White-throated Needletail [682]		Species or species habitat may occur within area
Merops ornatus		

Rainbow Bee-eater [670]	Species or species habitat may occur within area
Monarcha melanopsis	
Black-faced Monarch [609]	Breeding may occur within area
Myiagra cyanoleuca	
Satin Flycatcher [612]	Breeding likely to occur within area
Rhipidura rufifrons	
Rufous Fantail [592]	Breeding may occur within area
Xanthomyza phrygia	
Regent Honeyeater [430]	Species or species habitat likely to occur within area

Migratory Wetlands Species

Actitis hypoleucos	
Common Sandpiper [59309]	Roosting known to occur within area
Ardea alba	
Great Egret, White Egret [59541]	Breeding likely to occur within area
Ardea ibis	
Cattle Egret [59542]	Breeding likely to occur within area
Arenaria interpres	
Ruddy Turnstone [872]	Roosting known to occur within area
Calidris acuminata	
Sharp-tailed Sandpiper [874]	Roosting known to occur within area
Calidris canutus	
Red Knot, Knot [855]	Roosting known to occur within area
Calidris ferruginea	
Curlew Sandpiper [856]	Roosting known to occur within area
Calidris ruficollis	
Red-necked Stint [860]	Roosting known to occur within area
Calidris tenuirostris	
Great Knot [862]	Roosting known to occur within area
Charadrius bicinctus	
Double-banded Plover [895]	Roosting known to occur within area
Charadrius leschenaultii	
Greater Sand Plover, Large Sand Plover [877]	Roosting known to occur within area
Charadrius mongolus	
Lesser Sand Plover, Mongolian Plover [879]	Roosting known to occur within area
Gallinago hardwickii	
Latham's Snipe, Japanese Snipe [863]	Roosting known to occur within area
Heteroscelus brevipes	
Grey-tailed Tattler [59311]	Roosting known to occur within area
Limicola falcinellus	
Broad-billed Sandpiper [842]	Roosting known to occur within area
Limosa lapponica	
Bar-tailed Godwit [844]	Roosting known to occur within area
Limosa limosa	
Black-tailed Godwit [845]	Roosting known to occur within area
Numenius madagascariensis	
Eastern Curlew [847]	Roosting known to occur within area
Numenius minutus	

Little Curlew, Little Whimbrel [848] Numenius phaeopus	Roosting likely to occur within area
Whimbrel [849] Pluvialis fulva	Roosting known to occur within area
Pacific Golden Plover [25545] Pluvialis squatarola	Roosting known to occur within area
Grey Plover [865] Rostratula benghalensis s. lat.	Roosting known to occur within area
Painted Snipe [889] Tringa stagnatilis	Species or species habitat may occur within area
Marsh Sandpiper, Little Greenshank [833] Xenus cinereus	Roosting known to occur within area
Terek Sandpiper [59300]	Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Defence - OFFICES
Commonwealth Land - Director of War Service Homes
Commonwealth Land - Australian Postal Commission
Commonwealth Land - Australian Broadcasting Corporation
Commonwealth Land - Australian & Overseas Telecommunications Corporation
Defence - STOCKTON RIFLE RANGE
Commonwealth Land - Commonwealth Trading Bank of Australia
Commonwealth Land - Telstra Corporation Limited
Commonwealth Land - Australian Postal Corporation
Defence - ADF CAREERS REFERENCE CENTRE
Defence - TS TOBRUK
Commonwealth Land - Defence Service Homes Corporation
Commonwealth Land -
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Defence Housing Authority
Commonwealth Land - Commonwealth Bank of Australia

Commonwealth Heritage Places [Resource Information]

Name	Status
Historic	
Fort Wallace NSW	Listed place
Nobbys Lighthouse NSW	Listed place

Listed Marine Species [Resource Information]

Name	Status	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Roosting known to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat may occur within area

Ardea alba Great Egret, White Egret [59541]		Breeding likely to occur within area
Ardea ibis Cattle Egret [59542]		Breeding likely to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]		Roosting known to occur within area
Calidris ferruginea Curlew Sandpiper [856]		Roosting known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Roosting known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]		Roosting known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]		Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]		Roosting known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]		Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]		Foraging, feeding or related behaviour may occur within area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Species or species habitat may occur within area
Diomedea gibsoni Gibson's Albatross [64466]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Haliaeetus leucogaster		

White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Heteroscelus brevipes		
Grey-tailed Tattler [59311]		Roosting known to occur within area
Himantopus himantopus		
Black-winged Stilt [870]		Roosting known to occur within area
Hirundapus caudacutus		
White-throated Needletail [682]		Species or species habitat may occur within area
Lathamus discolor		
Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
Limicola falcinellus		
Broad-billed Sandpiper [842]		Roosting known to occur within area
Limosa lapponica		
Bar-tailed Godwit [844]		Roosting known to occur within area
Limosa limosa		
Black-tailed Godwit [845]		Roosting known to occur within area
Macronectes giganteus		
Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli		
Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis		
Black-faced Monarch [609]		Breeding may occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Breeding likely to occur within area
Numenius madagascariensis		
Eastern Curlew [847]		Roosting known to occur within area
Numenius minutus		
Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus		
Whimbrel [849]		Roosting known to occur within area
Philomachus pugnax		
Ruff (Reeve) [850]		Roosting known to occur within area
Pluvialis fulva		
Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola		
Grey Plover [865]		Roosting known to occur within area
Recurvirostra novaehollandiae		
Red-necked Avocet [871]		Roosting known to occur within area
Rhipidura rufifrons		
Rufous Fantail [592]		Breeding may occur within area
Rostratula benghalensis s. lat.		
Painted Snipe [889]		Species or species habitat may occur within area
Sterna albifrons		
Little Tern [813]		Breeding may occur within area
Thalassarche bulleri		
Buller's Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta (sensu stricto)		
Shy Albatross, Tasmanian Shy		Species or species habitat may occur within area

Albatross [64697]	
Thalassarche impavida	
Campbell Albatross [64459]	Species or species habitat may occur within area
Thalassarche melanophris	
Black-browed Albatross [66472]Vulnerable	Species or species habitat may occur within area
Thalassarche salvini	
Salvin's Albatross [64463]	Species or species habitat may occur within area
Thalassarche steadi	
White-capped Albatross [64462]	Species or species habitat may occur within area
Tringa stagnatilis	
Marsh Sandpiper, Little Greenshank [833]	Roosting known to occur within area
Xenus cinereus	
Terek Sandpiper [59300]	Roosting known to occur within area
Fish	
Acentronura tentaculata	
Shortpouch Pygmy Pipehorse [66187]	Species or species habitat may occur within area
Festucalex cinctus	
Girdled Pipefish [66214]	Species or species habitat may occur within area
Filicampus tigris	
Tiger Pipefish [66217]	Species or species habitat may occur within area
Heraldia nocturna	
Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]	Species or species habitat may occur within area
Hippichthys penicillus	
Beady Pipefish, Steep-nosed Pipefish [66231]	Species or species habitat may occur within area
Hippocampus abdominalis	
Bigbelly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]	Species or species habitat may occur within area
Hippocampus whitei	
White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]	Species or species habitat may occur within area
Histiogamphelus briggsii	
Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]	Species or species habitat may occur within area
Lissocampus runa	
Javelin Pipefish [66251]	Species or species habitat may occur within area
Maroubra perserrata	
Sawtooth Pipefish [66252]	Species or species habitat may occur within area
Notiocampus ruber	
Red Pipefish [66265]	Species or species habitat may occur within area
Phyllopteryx taeniolatus	
Common Seadragon, Weedy Seadragon [66268]	Species or species habitat may occur within area
Solegnathus spinosissimus	
Spiny Pipehorse, Australian Spiny Pipehorse [66275]	Species or species habitat may occur within area

Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Solenostomus paegnius Rough-snout Ghost Pipefish [68425]		Species or species habitat may occur within area
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat likely to occur within area
Pelamis platurus		

Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and Other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata		
Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat may occur within area
Caperea marginata		
Pygmy Right Whale [39]		Species or species habitat may occur within area
Delphinus delphis		
Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Grampus griseus		
Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus		
Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca		
Killer Whale, Orca [46]		Species or species habitat may occur within area
Stenella attenuata		
Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus		
Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str.		
Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

Places on the RNE [Resource Information]

Note that not all Indigenous sites may be listed.

Name	Status
Natural	
Glenrock Ornithological Area NSW	Indicative Place
Newcastle Bight Coastal Area NSW	Indicative Place
Hunter Estuary Wetlands NSW	Registered
Indigenous	
Stockton Rifle Range NSW	Indicative Place
Nobbys Head (Former Island) NSW	Registered
Historic	
Albion Hotel NSW	Indicative Place

Argyle House NSW	Indicative Place
Baptist Tabernacle NSW	Indicative Place
Beach Hotel NSW	Indicative Place
Bellevue Hotel NSW	Indicative Place
Burrundulla NSW	Indicative Place
Carrington Council Chambers (former) NSW	Indicative Place
Carrington Public School NSW	Indicative Place
Centennial Hotel (former) NSW	Indicative Place
Centennial Park NSW	Indicative Place
City Bank (former) NSW	Indicative Place
Civic Railway Station NSW	Indicative Place
Clarens House NSW	Indicative Place
Colliery Inn Hotel NSW	Indicative Place
Copse of Acacia Karroo NSW	Indicative Place
Cosmopolitan Hotel (former) NSW	Indicative Place
Croudace House & Garden NSW	Indicative Place
Dairy Farmers Building (former) NSW	Indicative Place
Drungalee NSW	Indicative Place
Eddy Street Residences NSW	Indicative Place
Gregson Park NSW	Indicative Place
Hamilton Public School (Including Infants School) NSW	Indicative Place
Hamilton Station Hotel NSW	Indicative Place
Hamilton Volunteer Fire Station (former) NSW	Indicative Place
Hunter District Water Board Building NSW	Indicative Place
Hunter Street Tramway Substation (former) NSW	Indicative Place
Ingall House NSW	Indicative Place
Islington Park NSW	Indicative Place
Jubilee Methodist Church NSW	Indicative Place
Lambton Park NSW	Indicative Place
Lambton Post Office (former) NSW	Indicative Place
Locomotive Depot (including Roundhouse) NSW	Indicative Place
Lyrique Theatre NSW	Indicative Place
Masonic Temple (former) NSW	Indicative Place
Mayfield House NSW	Indicative Place
McDonalds Building NSW	Indicative Place
Mine Managers Office (former) NSW	Indicative Place
National Australia Bank NSW	Indicative Place
Newcastle Hotel NSW	Indicative Place
Newcastle Showground & Grandstands NSW	Indicative Place
Newcastle Synagogue NSW	Indicative Place
Police Station and Residence (former) NSW	Indicative Place
Racecourse Inn (former) NSW	Indicative Place
Regent Theatre (former) NSW	Indicative Place
Regional Museum NSW	Indicative Place
School of Arts (former) NSW	Indicative Place
St Andrews Presbyterian Church NSW	Indicative Place
St Augustines Anglican Church NSW	Indicative Place
St Peters Anglican Church Group NSW	Indicative Place
T Walsh Building NSW	Indicative Place

Terminus Hotel NSW	Indicative Place
The Junction Soldiers Monument - WW1 NSW	Indicative Place
Trialba NSW	Indicative Place
Wickham Infants School (former) NSW	Indicative Place
Wickham Public School (former) NSW	Indicative Place
Wickham School of Arts (former) NSW	Indicative Place
Wolfe Street Automatic Telephone Exchange NSW	Indicative Place
Air Force Club NSW	Registered
Band Rotunda NSW	Registered
Bishopscourt NSW	Registered
Bogey Hole, the Commandants Bath NSW	Registered
Bond Store Group NSW	Registered
Bryn-Y-More NSW	Registered
Buchanan Terrace Group NSW	Registered
Castlemaine Brewery (former) NSW	Registered
Christ Church Anglican Cathedral NSW	Registered
Claremont NSW	Registered
Convict Lumber Yard Site NSW	Registered
Court Chambers NSW	Registered
Court House Column (former) NSW	Registered
Coutts Sailors Home (former) NSW	Registered
Customs House (former) NSW	Registered
David Cohen and Company Warehouse (former) NSW	Registered
Department of Public Works Building (former) NSW	Registered
Earp Gillam and Company Bond Store (former) NSW	Registered
Fort Scratchley Above Ground Buildings NSW	Registered
Fort Scratchley Group NSW	Registered
Fort Wallace NSW	Registered
Great Northern Hotel NSW	Registered
Harbour Master's Residence (former) NSW	Registered
Hillside NSW	Registered
Hunter Street Technical College and Trades Hall Group NSW	Registered
Hydraulic Power Station NSW	Registered
Irelands Bond Store (former) NSW	Registered
James Fletcher Hospital Group NSW	Registered
Jesmond NSW	Registered
King Edward Park NSW	Registered
Lance Villa NSW	Registered
Lance Villa Group NSW	Registered
Leading Light Tower Remnants NSW	Registered
Leading Light tower NSW	Registered
Masonic & City Bowling Club Gates & Piers NSW	Registered
Medical Superintendents Residence (former) NSW	Registered
Minumbah NSW	Registered
Newcastle Conservation Area NSW	Registered

Newcastle Courthouse NSW	Registered
Newcastle East Public School (former) NSW	Registered
Newcastle Post Office NSW	Registered
Newcastle Post Office Annex (former) NSW	Registered
Newcastle Post Office Group NSW	Registered
Newcastle Railway Station NSW	Registered
Nobbys Lighthouse NSW	Registered
Olympic Hall (former) NSW	Registered
Park NSW	Registered
Police Offices Including Stables NSW	Registered
Police Station (former) NSW	Registered
Police Station and Watchhouse NSW	Registered
Railway Paymasters Office (former) NSW	Registered
Segenhoe NSW	Registered
Shalamah NSW	Registered
Shandon NSW	Registered
Shepherds Hill Cottage and Surrounds NSW	Registered
Soldiers Baths NSW	Registered
St Andrews Presbyterian Church NSW	Registered
St Johns Anglican Church Group NSW	Registered
St Marys Star of the Sea Catholic Church NSW	Registered
St Phillips Presbyterian Church NSW	Registered
Stanton Catchlove and Company Bond Store (former) NSW	Registered
Station Masters Residence (former) NSW	Registered
Terrace House NSW	Registered
Terrace Row Group NSW	Registered
The Boltons Including Fences NSW	Registered
The Mission Theatre NSW	Registered
The Newcastle Club NSW	Registered
The Terrace Houses Group NSW	Registered
Tomago House Chapel NSW	Registered
Tomago House, Grounds, Trees and Chapel NSW	Registered
Victoria Theatre (former) NSW	Registered
Wallsend Civic Precinct NSW	Registered
Wallsend Courthouse NSW	Registered
Wallsend Post Office Including Original Stables NSW	Registered

State and Territory Reserves [Resource Information]

Tilligerry, NSW
Worimi, NSW
Worimi, NSW
Glenrock, NSW
Hunter Wetlands, NSW

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

North East NSW RFA, New South Wales

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced

plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Mammals		
Capra hircus Goat [2]		Species or species habitat may occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat may occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat may occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat may occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat may occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtiji		

Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]	Species or species habitat may occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]	Species or species habitat may occur within area
Ulex europaeus Gorse, Furze [7693]	Species or species habitat may occur within area

Nationally Important Wetlands **[Resource Information]**

Kooragang Nature Reserve, NSW
Hexham Swamp, NSW
Shortland Wetlands Centre, NSW

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:
- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:
- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:
- non-threatened seabirds which have only been mapped for recorded breeding sites;

- seals which have only been mapped for breeding sites near the Australian continent.

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-32.89178 151.75909

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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NSW National Parks & Wildlife Service
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Search Results

Your selection: Flora, threatened species, Selected Area - 151.70973,-32.94163,151.80973,-32.84163 returned a total of 15 records of 5 species.
Report generated on 03/06/2011 - 14:22 (Data valid to 25/04/2010)

view map | search again | clear selection

Choose up to 3 species to map.
** Exotic (non-native) species*

Plants	Map	Scientific Name	Common Name	Legal Status	Count	Info
Asteraceae						
	☐	Rutidosis heterogama	Heath Wrinklewort	V	1	
Elaeocarpaceae						
	☐	Tetratheca juncea	Black-eyed Susan	V	2	
Fabaceae (Faboideae)						
	☐	Pultenaea maritima	Coast Headland Pea	V	1	
Scrophulariaceae						
	☐	Euphrasia arguta		E4	1	
Zannichelliaceae						
	☐	Zannichellia palustris		E1	10	

** Exotic (non-native) species*
Choose up to 3 species to map.

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NSW National Parks & Wildlife Service
atlas of nsw wildlife

Search Results

Your selection: Fauna, threatened species, Selected Area - 151.70973,-32.94163,151.80973,-32.84163
returned a total of 2478 records of 50 species.
Report generated on 03/06/2011 - 14:19 (Data valid to 25/04/2010)

view map | search again | clear selection

Choose up to 3 species to map.
** Exotic (non-native) species*

Amphibia	Map	Scientific Name	Common Name	Legal Status	Count	Info
Hylidae						
	☐	Litoria aurea	Green and Golden Bell Frog	E1	680	ℹ

Aves	Map	Scientific Name	Common Name	Legal Status	Count	Info
Acanthizidae						
	☐	Pyrrholaemus saggitatus	Speckled Warbler	V	1	ℹ
Accipitridae						
	☐	Circus assimilis	Spotted Harrier	V	1	
	☐	Hieraaetus morphnoides	Little Eagle	V	3	
	☐	Lophoictinia isura	Square-tailed Kite	V	1	ℹ
	☐	Pandion haliaetus	Osprey	V	8	ℹ
Anatidae						
	☐	Stictonetta naevosa	Freckled Duck	V	4	ℹ
Anseranatidae						
	☐	Anseranas semipalmata	Magpie Goose	V	1	ℹ
Ardeidae						
	☐	Botaurus poiciloptilus	Australasian Bittern	V	5	ℹ
	☐	Ixobrychus flavicollis	Black Bittern	V	1	ℹ
Burhinidae						
	☐	Burhinus grallarius	Bush Stone-curlew	E1	3	ℹ
Cacatuidae						
	☐	Callocephalon fimbriatum	Gang-gang Cockatoo	V	1	ℹ
	☐	Calyptorhynchus lathami	Glossy Black-Cockatoo	V	1	ℹ
Charadriidae						
	☐	Charadrius leschenaultii	Greater Sand-plover	V	10	ℹ
	☐	Charadrius mongolus	Lesser Sand-plover	V	335	ℹ
Ciconiidae						
	☐	Ephippiorhynchus asiaticus	Black-necked Stork	E1	31	ℹ
Columbidae						
	☐	Ptilinopus superbus	Superb Fruit-Dove	V	1	ℹ
Diomedeidae						
	☐	Diomedea exulans	Wandering Albatross	E1	1	ℹ
Estrildidae						
	☐	Stagonopleura guttata	Diamond Firetail	V	1	ℹ
Haematopodidae						
	☐	Haematopus fuliginosus	Sooty Oystercatcher	V	11	ℹ

	Haematopus longirostris	Pied Oystercatcher	E1	15	
Jacanidae					
	Irediparra gallinacea	Comb-crested Jacana	V	3	
Laridae					
	Sterna albifrons	Little Tern	E1	301	
Meliphagidae					
	Epthianura albifrons	White-fronted Chat	V	43	
Petroicidae					
	Petroica boodang	Scarlet Robin	V	1	
Procellariidae					
	Macronectes giganteus	Southern Giant Petrel	E1	1	
	Pterodroma solandri	Providence Petrel	V	1	
	Puffinus carneipes	Flesh-footed Shearwater	V	2	
Psittacidae					
	Lathamus discolor	Swift Parrot	E1	1	
	Neophema pulchella	Turquoise Parrot	V	1	
Scolopacidae					
	Calidris tenuirostris	Great Knot	V	35	
	Limicola falcinellus	Broad-billed Sandpiper	V	78	
	Limosa limosa	Black-tailed Godwit	V	285	
	Xenus cinereus	Terek Sandpiper	V	563	
Strigidae					
	Ninox strenua	Powerful Owl	V	4	
Sulidae					
	Sula dactylatra	Masked Booby	V	1	
Tytonidae					
	Tyto novaehollandiae	Masked Owl	V	1	

Mammalia	Map	Scientific Name	Common Name	Legal Status	Count	Info
Balaenopteridae						
		Megaptera novaeangliae	Humpback Whale	V	1	
Dugongidae						
		Dugong dugon	Dugong	E1	2	
Molossidae						
		Mormopterus norfolkensis	Eastern Freetail-bat	V	2	
Otariidae						
		Arctocephalus forsteri	New Zealand Fur-seal	V	1	
Petauridae						
		Petaurus norfolcensis	Squirrel Glider	V	2	
Phascolarctidae						
		Phascolarctos cinereus	Koala	V	2	
Pteropodidae						
		Pteropus poliocephalus	Grey-headed Flying-fox	V	17	
Vespertilionidae						
		Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	1	
		Miniopterus australis	Little Bentwing-bat	V	2	
		Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	7	
		Myotis macropus	Southern Myotis	V	3	
		Scoteanax rueppellii	Greater Broad-nosed Bat	V	1	

Legal

Reptilia	Map	Scientific Name	Common Name	Status	Count	Info
Cheloniidae						
	☐	Chelonia mydas	Green Turtle	V	1	

** Exotic (non-native) species*

Choose up to 3 species to map.

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